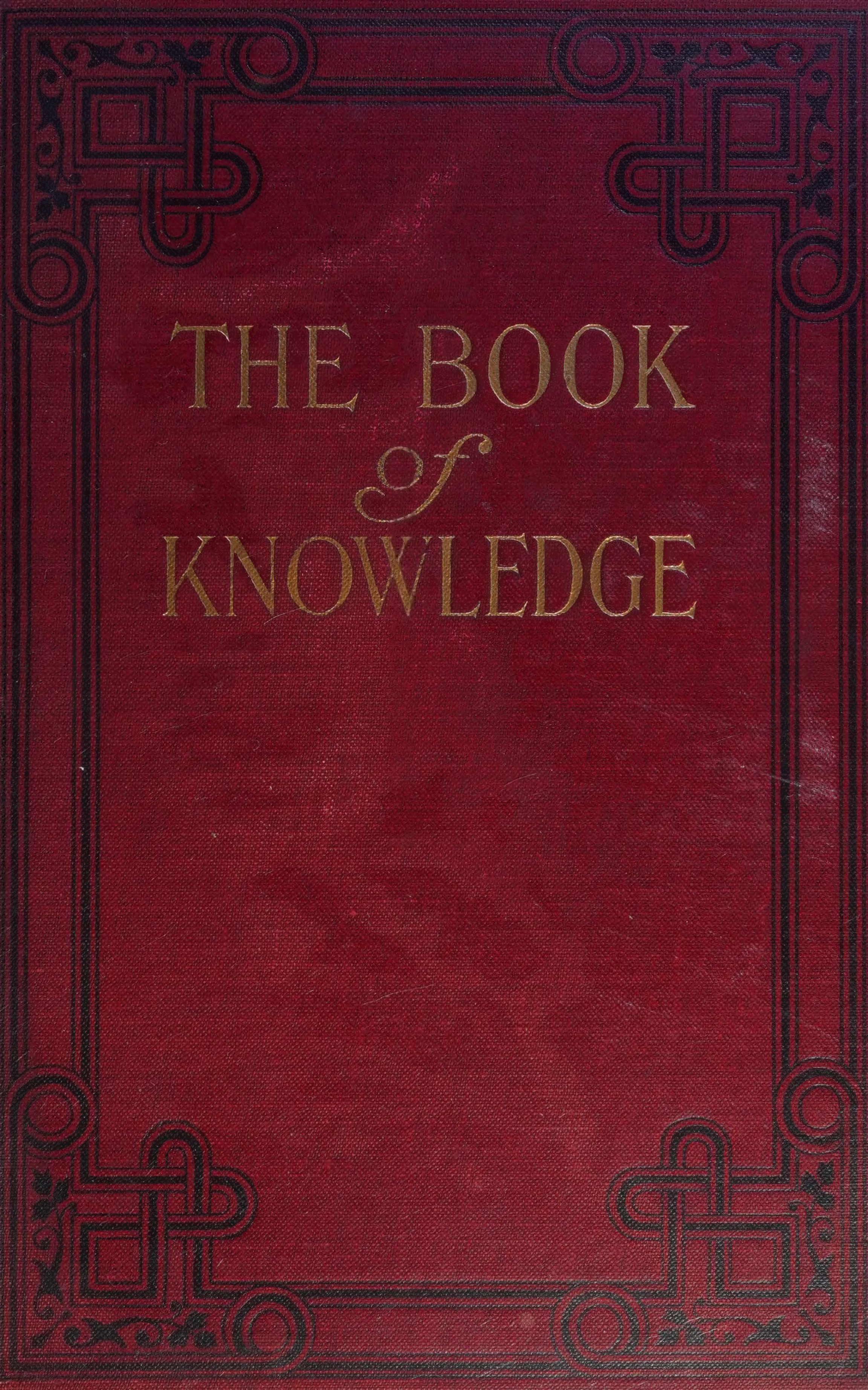

THE BOOK of KNOWLEDGE

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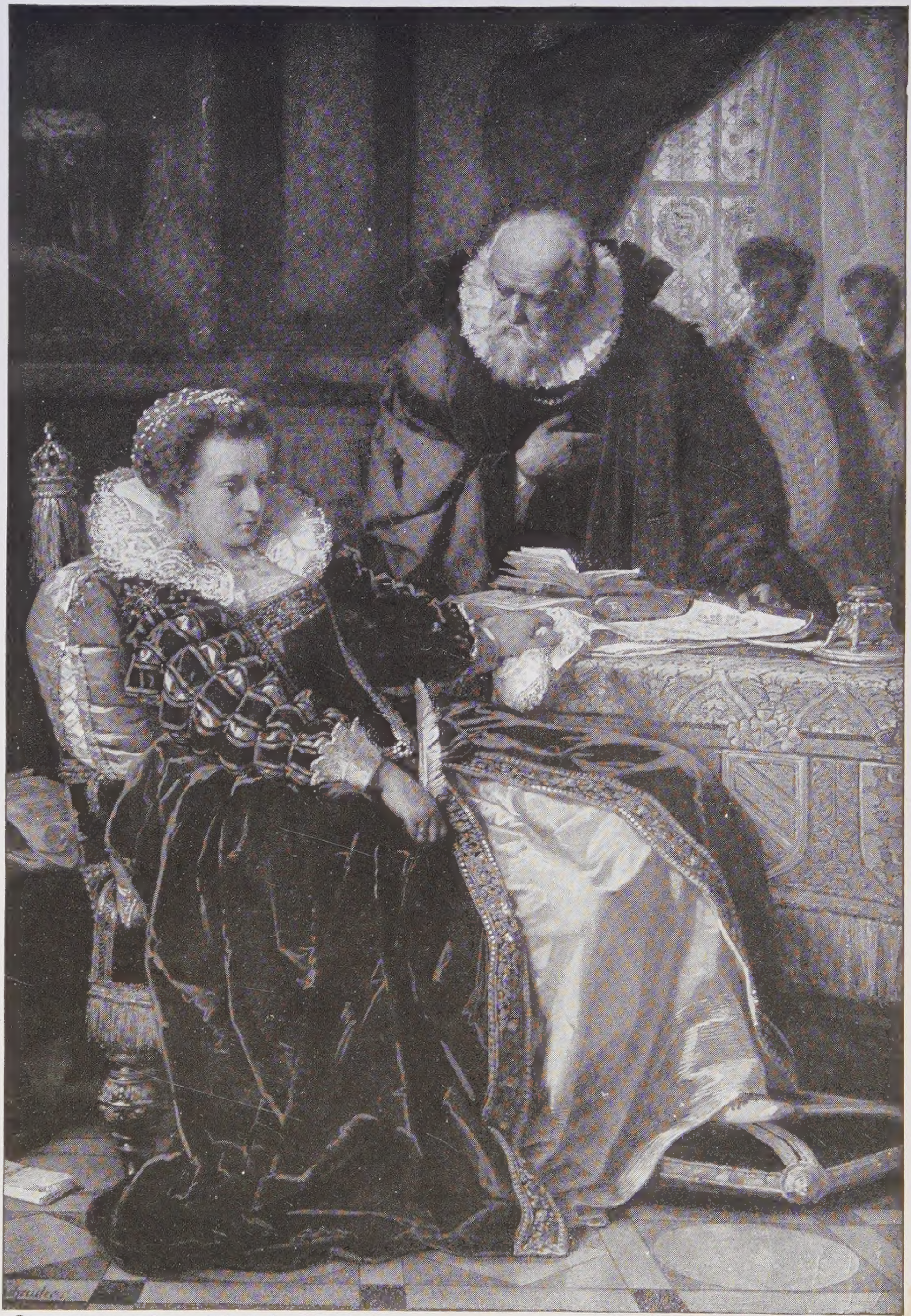
THE DEATH WARRANT OF MARIE STUART



In many ways, Queen Elizabeth of England was a very good and wise queen, but she was guilty of one cruel deed which will remain a blot upon her memory forever. She hated Mary, Queen of Scotland, and secretly desired her death, and when the poor, weak queen fell into her power, she cast her into prison. Here we see Davison persuading Queen Elizabeth to sign Mary's death warrant, which she finally did.

The Book of Knowledge

The Children's Encyclopædia

EDITORS-IN-CHIEF

ARTHUR MEE
Temple Chambers, London

HOLLAND THOMPSON, Ph.D.
The College of the City of New York

WITH AN INTRODUCTION BY

JOHN H. FINLEY, LL.D.
Late President of the College of the City of New York
Commissioner of Education of the State of New York

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This is a short guide only to the principal contents of this volume. It is not possible to give the titles of all the Poems and Rhymes, Legends, Problems, color pages, questions in the Wonder Book, and many other things that come into the volume; but in all cases the pages where these parts of our book begin are given. The full list of these things comes into the big index to the whole work.

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The land crabs of the West Indies go inland from the sea to live, but return to the sea to lay their eggs. When marching down to the sea they climb walls and cliffs, nothing stopping them.

SEA ANIMALS IN ARMOUR

CONTINUED FROM 2610

At first sight it might appear that the sea animals which live in shells would prove dull company. But that can only be so to those who do not trouble to study the lives of these creatures of the deep. We shall find that they are as interesting as anything in the whole of Nature's books. The characters for the present story are among crustaceans, the animals that live in shells or living coverings, like the crabs, lobsters, crayfish, and shrimps ; and molluscs, the soft-bodied animals which are provided with shells, like the mussels and oysters. Cuttle-fish are molluscs ; but we have dealt with them already. Then there are the gastropods, a sub-family including the whelk and his kindred.

Let us first consider the story of the crabs. This is a family of many sorts, not all living in the sea, placed at the head of the crustaceans. The one with which we are all most familiar is the crab which comes to table. The head, throat, and what we may call the chest are all joined together, and from here the ten legs, arranged in five pairs, grow out. They do not always present this form. When young, the little crab looks quite unlike its parents. It undergoes several changes from the state in which, lacking legs and claws, it first peeps forth into the world. The stages through which it passes show us what the crab was like in the old, old days. It attains its changes by what in the birds we call molting. Again and again it casts its outer covering, and with each new coat comes a greater likeness to its parents, until it appears before its family in a handsome little shell, with all its legs fully mailed, and its claws hard and active, ready to do battle with its enemies, or to grasp the food which it needs. When this stage has been reached, all that it has to do is to change its size, not its form.

Little crabs in full armor of shell must change into big crabs in full armor of shell, and big crabs must become still bigger. Still the molts go on. It is a very inconvenient and painful process, and so hard that very many crabs die when molting. Fancy if every now and again we, when growing, had to climb out of our skins ! Well, that is what the crab must do. His fat little body has grown too big for his shell, and out he must come, or burst. But how can he withdraw himself from that stiff, unbending mail? Nature has provided a way.

THE WAY IN WHICH THE CRAB ESCAPES FROM ITS HARD SHELL

He has strong claws and thick legs by this time, and how is he to get them through the tiny joints by which the shells of the claws and legs are fitted to the rest of the shell? He simply has to draw them back, up the shell, and through the joints. The watery condition of the flesh enables the limbs to be compressed. But it is a serious business. Think what a struggle the big male crab must have! His claws, prized by those who eat crabs, are so big that they make him worth five times as much money to the fishermen as the female crab is. Well, they have to be dragged out of the old shell, just in the same way as have the smaller claws of the female. There is no royal road to freedom from the old shell.

While the old shell is being made ready to come off, there is a new shell forming over the flesh of the crab underneath; but it is quite soft and flexible until the old one has been molted. The great effort is made, and the old shell is cast, seemingly without a rent or split in it. A soft-bodied crab crawls miserably forth, and scurries away into a crevice in the rocks to hide.

THE TERRORS OF THE CRAB WHICH HAS LOST ITS SUIT OF ARMOR

He is now as soft as can be, and any other crab would snap him up at once. It takes many hours, or it may be days, for the new shell to harden. Until that has happened our little friend is in mortal terror that some hard-shelled brute shall come along and eat him up; but when the new shell is solidified, Master Crab is ready to do battle against all the rest of the crabs. In fact, he rather likes that. He is a rascal to fight. He does not in the least mind biting off an enemy's claws; and he is just as ready to sacrifice his own. What does he care? Claws will grow again. It may take several molts to do it, but in time the claws will bud out and refit him, just like the new tails which grow on the lizards, of which we have often read.

We have several species of crabs around our coasts. There are the blue crab; the green crab, which is not often eaten in this country, though its near relative is highly esteemed as food in Europe. We have the beautifully colored lady crab, the mud crab, the rock crab, the Jonah crab. Then there are the slender spider crab and the interesting little pea crab, or oyster crab.

The pea crab is an interesting variety. Like the hermit crab, it goes into hiding. But instead of taking up its home in an empty shell, it dives into the open shell of a living mollusc, and there lives like the hermit in an anemone, sharing the food which, by opening and shutting its shell, the mollusc draws in.

The blue crab is the crab that we know so well as the soft shell crab. After this crab has molted its hard shell, while the new shell is still soft, the flesh has a more delicate flavor, and it is when it is in this state that fishermen are anxious to catch it and send it to market.

THE MARCH OF THE CRABS OVER WALLS AND CLIFFS TO THE SEA

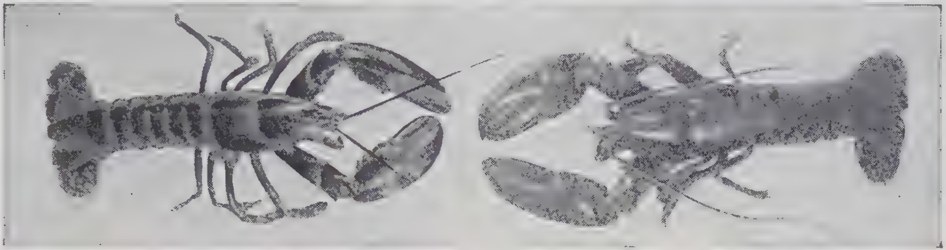
Other crabs are more interesting crabs than these. Some of them have made themselves so much at home on shore that they have altered the character of their breathing. Most of the crab family breathe by way of gills, but some can actually be drowned in water. Some crabs frequent fresh-water streams and ascend mountains. One of the most remarkable is the West Indian land crab. Here is a creature which makes its home two or three miles from the sea. But when the females wish to lay their eggs, they do not lay them and carry them attached to their bodies as most crabs do; they must make their way back to the sea to lay them in the sand. So all the crabs gather together into an army, the males leading the way.

There may be enough to form a host more than a mile long and forty yards wide. On they march, regardless of all obstacles. They go on as resolutely as the lemmings. Houses and walls and cliffs do not stop them. They never turn aside, but keep straight on, though hundreds may be killed in the climb. Arrived at the sea, the females lay their eggs, the annual migration is at an end, and the old ones are free to make their way back inland.

Another land crab, called from its

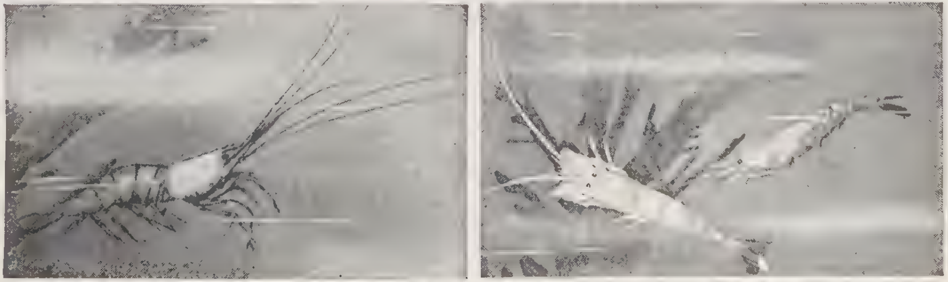
CREATURES THAT GIVE UP THEIR SHELLS

The lobster after it has been cooked is bright red, but when alive is bluish black. Here we see one in all the glory of its armor of shell, ready to do battle with the best of lobsters, for any cause or no cause at all.



Now we may see the difference between the lobster with his shell and without. On the left he has no armor. On the right is the shell out of which he has drawn himself, to remain defenceless till a new one hardens.

It is said the crayfish may live 15 or 20 years, but it has a terrible life at the beginning. It has to molt 15 times in three years—eight in the first year, five in the second, and two in the third.



The first of these pictures shows a prawn. The second is a picture of shrimps. Prawns are beautifully colored and armed with a notched spear. Shrimps, to avoid enemies, are colored just like the sandy water in which they live. They have such a powerful sense of smell that even blind shrimps readily find food.

The photographs on these pages are by W. B. & S. C. Johnson and others.

fleetness the swift land crab, does not go so far from the water; but, still, it cannot remain long in the sea. These crabs live together on the beaches, each making a burrow for itself. When threatened with danger, they run with great speed to their holes. Should a crab get to the wrong burrow, the owner makes a scraping noise, and the lost one bolts off, braving the danger from any foe in the open in preference to entering the home of one of its own kind. Another famous land crab is the calling crab. One of its claws is extremely large, and as the crab runs—which it does with great speed—it holds this claw aloft as if beckoning. In the southern states it is sometimes called the fiddler crab. All crabs are supposed to possess intelligence, and this one certainly does. He makes a big burrow to live in, which is a foot or more in depth, and is very particular to keep his home clean and tidy.

Japan has a large crab in which we are much interested. Its flesh is good for food, and thousands of tons of its flesh are packed every year in wooden lined boxes and brought to this country.

THE SURPRISING CLEVERNESS OF SOME OF THE CRABS

The wonders of the crab family are not yet exhausted. Some of the species carry anemones in their claws to hide them either from enemies or the creatures which they mean to attack; some permit other shell-fish to settle upon them, so gaining shelter from observation. But the strangest of all is the crab which lives on cocoa-nuts. This is called scientifically the birgus latro, and lives in the islands of the Indo-Pacific seas. The biggest of all the crabs, it makes its home by burrowing deep at the roots of the cocoa-nut trees, and its food comes from the nuts which fall. Taking a fallen nut, it strips off the fibre with its great claws, then hammers away at the "eyes" of the nut until an opening is made. Through this opening or openings the crab thrusts its smaller claws, and so drags out the meat of the nut. It may even thrust in the smaller claws and swing the nut bodily upon the ground to smash it. This crab is good for food. The natives melt it, and obtain from its body as much as a quart of pure oil, which it has derived from the cocoa-nut.

HOW THE LOBSTER LOSES CLAWS IN BATTLE AND GROWS NEW ONES

In one respect the crab has his equal in the lobster—that is, in the matter of fighting. Lobster will fight lobster without the least provocation, and the warriors will sacrifice their limbs with as little to-do as a crab, and repair the loss more quickly. They can always grow a new claw to replace one which has been lost, but, naturally, it requires more than one molt to make the new one as *large* as the old. As we all know, the natural color of the lobster is a bluish black; but when it has been boiled it changes to a brilliant scarlet. Like the crab, the mother lobster carries her eggs about with her. She lays them in the autumn, and they hatch in the following midsummer.

Lobsters are found on the Atlantic coasts both in Europe and America. The American lobster is closely related to the European lobster, but is not quite the same, and is larger. It is found from Labrador in the north as far as Delaware to the southward. Lobsters are also found in the Pacific, but as they are not of so fine a flavor, efforts are being made to introduce the Atlantic lobster to the western coast.

A flourishing lobster fishery is carried on in the north-eastern states and in the Maritime Provinces of Canada. Unfortunately the fishermen are so foolish that the lobsters are in danger of being killed off, and the governments of both the United States and Canada have had to take steps, by saving the eggs in hatcheries, to re-stock the lobster grounds. Laws have been made in both countries to protect young lobsters until they have grown large enough to produce eggs, but these laws are not always kept.

THE HARD LIFE OF THE YOUNG CRAYFISH WITH ITS MANY SHELLS

The young lobsters are capital swimmers, but they do not swim away from their crawling parents. The mother lobster is a really good old lady, and loves her babies. She may be seen hiding under a rock with her big claws sticking out, and the little ones playing between them. At the first sign of danger she rattles her claws, and the baby lobsters immediately run under her body for shelter.

The molt of the lobster is an even more serious matter than that of the crab, for not only does it cast its shell, but it actually casts the membrane by which its stomach is lined. In this, lobsters are resembled by the crayfish, the fresh-water lobster, which many people eat. It is easily distinguished by its smaller claws. Little crayfish have not to begin in so strange a form as the crabs and lobsters, being more like their parents, but they have a hard life of it. Eight molts have to be got through in the first year, five in the second, and two in the third. After every molt the crayfish is soft and helpless until the new shell hardens. A species of crayfish which is found in the Mammoth Cave in Kentucky is quite blind.

THE GORGEOUS PRAWNS, AND THE SHRIMP THAT BURIES ITSELF IN THE SAND

The next step in the family takes us to the shrimps and prawns. Some of the latter, in the West Indies and in Central America, are nearly as big as lobsters. In northern waters, they are smaller than this, but those of good size are awkward creatures to handle. The long, sharp, saw-like spear with which they are armed inflicts quite bad injuries upon the hand, unless the fisherman be very careful. The shrimps are the small relations of the prawn. They are not so handsome as the prawns, which are often beautifully streaked with color. The shrimps are, however, very active and graceful, and are so nearly like their surroundings that it is very difficult to see them when they are at rest. But that is not often. In the shallow pools where enemies cannot overtake them, they are so active that we have to be very alert with the net to make a catch. Where fishes which eat them abound, the shrimps hide during the day and wait for their food until night. They dig holes in the sand by excavating with the hind legs, sinking part of the body into the hole, then throwing the sand over themselves. Prawns and shrimps undergo the molting process like crabs and lobsters, and, like them, have a keen sense of smell, which guides them to their food.

THE WONDERFUL LITTLE SCAVENGERS WE MAY ALL FIND ON THE SEASHORE

Nearly related to the shrimps are those curious little things, the sand-fleas, which we find in the sand upon all our beaches. They are first-rate scavengers, and help to keep the beach healthy when the tide is out. They will eat anything—carrion or decaying seaweed. Their jump is accomplished by bending the body, then suddenly flinging it open, like the bending and relaxing of the bow which sends the arrow speeding to its mark. On many coasts we find the sand-screw, which has to wriggle along on its side when the surface is dry, but moves with speed when moisture eases the way. Related to these is the corophium, a twelve-legged little creature with two immense horns. With the latter it beats the ground most carefully to find its pet food, the fat lugworms which live head downwards in the sand and mud of the seashore. The lugworm or lobworm is bigger than the worm that we see in the garden, but twenty or thirty of these little animals pounce upon it and destroy it, just as we see ants destroy a caterpillar.

It is in the same family that we find the gribble and the wood-shrimp. These do great damage to timber by boring tunnels in it. But we can leave their performance and pass on to the molluscs to find two famous examples, the pholas and the teredo. The pholas, which is more commonly called the piddock, is a soft-bodied creature in a fragile shell, found in Europe. It can bore its way into the hardest sandstone, limestone, slate, or wood. Portland stone seems to be too much for it, because of the flinty nature of that formation. The pholas makes its two shells its hammer and chisel.

A SOFT BORER WHOSE WORK TAUGHT A MAN HOW TO MAKE A TUNNEL

It first protrudes a stout foot, and, with this to act as a sucker, it glues itself to the stone upon which it is to work; then, by the action of its shell, it slowly and laboriously grinds itself into the hard material. When it has got far enough in to make itself a home, it rests content, and burrows no farther.

The teredo is more feared and disliked than the pholas, for it does enormous damage to wooden ships, and to the timber defences of harbors, wooden supports of bridges, and so forth. It has the appearance of a long, whitish worm, about an inch in circumference, but from 12 to 30 inches in length. It can eat its way through any sort of wood, though, naturally, it prefers some to others. Not content with making a channel for itself through the solid timber, it builds a tunnel of calcium carbonate wherever it goes. Thus it can move freely, and at the same time be sure that its boring will not cause the woodwork to collapse upon it.

The teredo is found all over the world, and is very destructive to wooden ships and piling. At one time it did so much damage to the dykes in Holland that it seemed possible that the sea might sweep in over the land before the injury could be repaired. In this country we have commenced to guard against its ravages by using stone and cement for harbor work instead of wooden piling.

Now we come to armored animals which like the mussels and clams and oysters are called bivalves. The teredo is a bivalve too, but grows out of its shells. That means, of course, that their soft bodies are enclosed in a shell consisting of two valves or halves. The shells work upon an elastic hinge, and close by a muscle which is very strong. Some mussels yield pearls, as the oysters do. They are not so fine as those of the Oriental oysters, but mussel pearls have long been famous. It was in order to secure British pearls that the Romans first went to England, so the mussels may have played a part in attracting to that country the first civilizing influence it ever knew.

THE TRAVELS OF THE BABY MUSSEL ANCHORED TO A FISH

Pearl mussels are found in many of our rivers. Some of the pearls found are very valuable, and numbers of the smaller pearls that we see in the shops come from this source. Quantities of pearl buttons are made from the lining of the shells. One very interesting feature of their career we must notice. They make their pearls to get rid of the discomfort caused either by an egg remaining in their shell, or by the intrusion of a grain of sand or some other unwelcome body. They do not like parasites, but they themselves are parasites in the early stages of their existence. The young ones, when they leave their mother, have two little hooks attached to their shell. With these they fasten themselves to a fish, and there they cling and grow until they are large enough to set up house for themselves. Then they sink to the bottom of the water and grow into big mussels. The young mussels require particular fishes to which to attach themselves, and in the great nursery which the government maintains on the Mississippi, these fishes are provided for them.

Mussels live in the sea also, and sea mussels are quite as good to eat as oysters.

SPINNING SILK IN THE SEA TO MAKE AN ANCHOR FOR THE MUSSEL

In speaking of the oysters and mussels, we say that they, in common with other bivalves, "attach themselves" to the rocks, or whatever it may be. But how can creatures whose outside consists only of hard shell attach themselves to hard, slippery rock, or the hard, slippery shell of some crustacean? The reason is that they spin a sort of silk. "Spin" may be a strange word to use, but that is what it really means. In nothing else is this operation better carried out than in the sea mussel. The mussel has a foot, like the pholas, and this acts as a sucker, to hold the creature to the rock. But that is only a temporary anchorage.

From the interior of the mussel is spun what we call its byssus. Strands of silky texture are put forth by the mussel and woven into a sort of string. This holds to the rock or timber or even smoother surfaces. Mussels collect together in great masses, such as many of us have seen at the seaside, and, no matter how the heavy waves beat upon them, they hold their positions in safety. Each mussel spins its own byssus, but it joins its own to that of its fellows. They make all the separate ropes into one strong rope. From this central rope all of them depend.

Engineers know the strength of the mussel's rope. When the breakwater at Cherbourg was being built, the French engineers deposited several thousands of mussels upon the loosely piled masses of stone, knowing that these little creatures would bind the whole together with their silk better than any cement made by hands could bind it.

Clams are bivalves also, but they do not fasten themselves to the rocks. The hard shell clam, sometimes called the quahog, has strong shells with a very sharp edge. It lives in the shallow waters along the eastern coasts, and moves itself along the sandy sea bottom

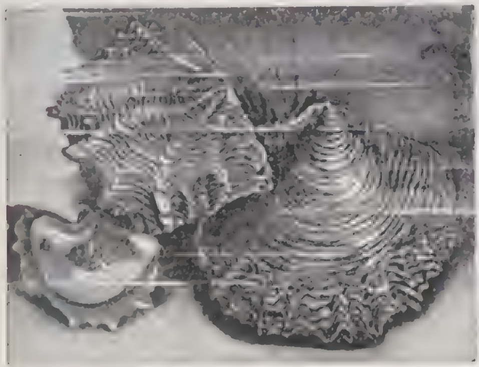
LITTLE WONDER-WORKERS OF THE SEA

Wherever there is damp sand at the seaside we may expect to see sand-hoppers, the best of scavengers.

This mollusc can bore its way into rock which would blunt a strong chisel. It is the pholas, and makes the two halves of its shell its hammer and chisel.

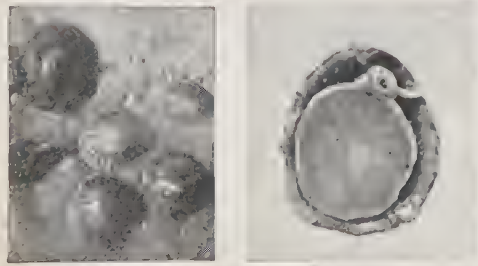
The lug-worm, nearly a foot long, lives in the sand and mud of the shore.

The teredo, which can riddle wooden ships, is seen here in its tunnel.

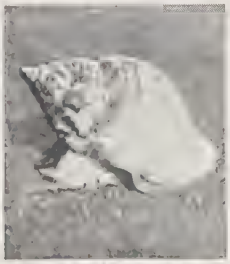


The oyster shown here is of the sort which, getting sand or some other obstruction into its shell, covers it all over, making it into a lovely pearl.

The mussel clings to a rock with its sucker-foot, then spins a rope of silk and hangs so fast that the most powerful waves cannot tear it away.



Limpets cling to rocks, and cannot be dislodged. The sucker-like foot on the right explains the mystery.



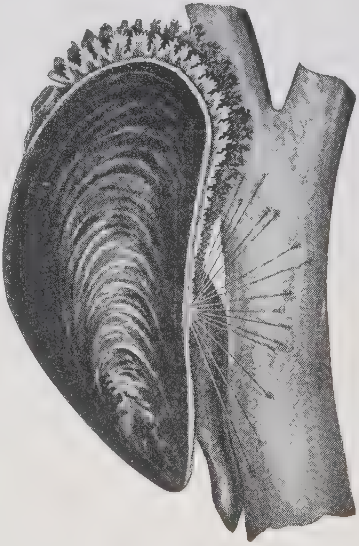
The whelk is an enemy of nearly all other shell-fish.

The periwinkle is a friend to young oysters.

with the sharp edge of the shell. Young hard shell clams are known as little neck clams. Hard shell clams are gathered in with rakes, but soft shell clams are caught in a different fashion. Soft shell clams live buried in the sand above low-water mark. They dig themselves down with a strong muscle, called a foot, and lie just below the surface of the sand where they can breathe. When the tide goes out, clam gatherers follow it down the beaches, dig up the clams, and send them to market. Other clams, such as the razor clam and the painted clam, are found on the Atlantic coast, but are not eaten.

Many of us who have never been near the New England shores have heard or read of the fun and frolic at clam bakes and shore dinners. It is the juicy soft shell clam that is used on these occasions. The razor clam, which has a narrow knife-shaped shell, is used only for bait.

Clams are found in Europe, but are not much used for food, and in India there is found an enormous clam which weighs over four hundred pounds. The shellfish which is called a clam on the Pacific coast belongs to another family.



The mussel has clung to a support and can now defy the waves. His sucker-foot clings to the log, and he is further secured by the strands of silk which he has spun.

Scallops are much larger than clams or mussels, and those that live in the Gulf of St. Lawrence and across the bleak Labrador shores are sometimes four or five inches across the shell. Some scallops have a byssus like the mussel, but generally they do not attach themselves to the rocks. The young scallops hatch out of the eggs in two or three days, and are quite grown up in a couple of years.

The great muscle of the scallop is very large, and it is this part of the fish that is eaten. That is why the scallop as sold by the fish-markets gives us no idea of the beautiful bivalve from which it comes.

THE OYSTER THAT SWIMS IN ITS BABYHOOD

Most of us know the rough grey shell of the oyster, for it can live so long out of water that it is possible to send it long distances from the sea-coast. Oysters might almost be called the national dish in the United States, and actually half a million acres of shore line and shallow water on the coast are devoted to their cultivation.

When the young oyster is born, it is so small that it cannot be seen with the naked eye. In this stage of its life, it swims about, and is sometimes carried by the current miles away from the place of its birth. Millions and millions of young oysters in this stage are eaten by fish, and millions more are swept away by the waves. How long they swim about, we do not know; but it may be about a week or so. They soon settle down, however, sink to the bottom, and attach themselves to rocks, sunken logs, or anything else that will give them firm hold, and there they live for the rest of their days. In oyster farms, tons of old oyster shells are spread over the bottom to give the young oysters, or spat as they are called, a good resting-place. Oysters lie with their shells gaping open, so that the water may flow through, and thus bring them food and enable them to breathe.

There are at least a hundred different varieties of oysters in the world. They are eaten almost everywhere, and are so much esteemed as food that they have been cultivated for centuries. The Chinese have had oyster farms for at least two thousand years, and the Italians began their cultivation about 100 B.C. Pearl oysters are described on page 189, and we may read about the oyster fisheries in the story beginning on page 1341.

Whelks and periwinkles are not used for food in this country, but are prized by some of the people in Europe. They are univalves, that is, they have only one shell. The periwinkles live on sea vegetation, but whelks are carnivorous.

THE NEXT STORIES OF NATURE ARE ON PAGE 2699.

WOMEN WRITERS OF ENGLAND

CONTINUED FROM 2498

BEFORE the later years of the eighteenth century there are few, if any, women writers we need read about. But to know even a little about the history of the women writers is to understand a very great change that has taken place in regard to the position of women in our times. From very early times men wrote all sorts of books, but until about a hundred years ago it was thought that the writing of books was no work for women. The great-grandmother of Maria Edgeworth, one of the famous writers we are to read about, thought that a lady need not be educated beyond the ability to know her Bible, and to make up the weekly accounts of the household. This was something more than a hundred years ago, and that old-fashioned lady only spoke what most of the ladies of her time believed. We, living in a day when quite as many books are written by women as by men, can see how greatly times have changed.

It is often said that women cannot rise to the heights achieved by men in the various arts. But while this may be true—for there is certainly no woman's name that can be ranked with Shakespeare or Milton or Scott—some women have written books which no man has excelled. This cannot be said of the first woman writer with whom we are concerned; yet the name of Fanny Burney, which, in point of time, must head the procession of brilliant English women writers, is likely to remain famous, and her works will probably be read as long as most of those written by the story-tellers of whom we have read in the BOOK OF KNOWLEDGE. Fanny Burney was born at the town of Lynn, England, June 13, 1752. Her father, a distinguished musician, had gone there as organist and music-teacher because his health was delicate; but he afterwards returned to London, where he lived to the ripe age of eighty-eight, and was the friend of most of the eminent men of his day. The great Dr. Johnson; Sir Joshua Reynolds, the famous artist; Edmund Burke, the philosopher; and Garrick, the greatest actor of his time, were among the notable visitors at the home of Dr. Charles Burney.

Fanny Burney was just eight years of age when her father returned to London, and a more shy or backward child it would be difficult to imagine. All her brothers and sisters were bright and promising children, but Fanny gave not the slightest hope that she would ever do anything remarkable. At eight years of age she did not even know her A B C, and so quiet and retiring was she that she was in danger of being neglected altogether, not only by the famous visitors to the house, but by her father and her stepmother.

FANNY BURNEY, "THE LITTLE DUNCE," AND HOW SHE BEGAN TO WRITE

Yet the little girl's very modesty attracted some people, and when her stepmother, an estimable lady, was accused of not paying Fanny sufficient attention, she replied that "she had no fear about Fanny," and refused to waken up "the little dunce" by using the rod, as had been suggested.

Fanny was, indeed, only another proof that it is not always the bright and lively child that grows into a clever man or woman. For had it not been for what this little dunce achieved in later years, the name of Burney, and perhaps even her father's own fame, would have been quite forgotten long ago. As soon as Fanny did learn her letters she became a great reader; and almost as soon as she could read she began to write stories.

At first this was thought mere child-play, and she was allowed to scribble away to her heart's content; but when she was sixteen or seventeen she had written a large number of stories, and her stepmother pointing out to her how unladylike it was to think of being a novelist, Fanny one day made a bonfire of all her writings, and resolved to invent no more stories.

A GREAT STORY THAT WAS WRITTEN IN SECRET BY A YOUNG WOMAN

We may be sure the world lost nothing by the bonfire; but among the stories which she burned was one that had so engaged her imagination that, before very long, she found the temptation to weave it over again too strong, and though she still refrained from writing, she composed in her mind the whole of the new story which had grown out of the one she had burned. It would, indeed, have been a pity if she had kept her word to write no more, for then the world would never have read that most charming of her stories, "Evelina."

It was by stealth she wrote it, however, so that neither her father nor her stepmother should know; and although it was not published until she was twenty-three years old, it had probably been finished long before then. So little did she estimate the value of the book, that she sold it to her publisher for $100; and though it was printed without her name, her father soon guessed that it was the work of his daughter, and realized that his daughter was a genius. "Miss Burney is a real wonder," was Dr. Johnson's opinion of her on reading the book, which is full of a deep and true knowledge of life, such as we should only expect from a person of mature years, and not from a mere girl.

Before long, Fanny Burney became famous; she was the lion of the literary and fashionable world of her time, and her second novel, "Cecilia," published four years later, was also a great success. Becoming known to the royal family, Queen Charlotte appointed her second Keeper of the Robes, a post which she soon was glad to give up.

WHAT FANNY BURNEY DID FOR ENGLISH LITERATURE

When she was forty, Fanny Burney married a French general named D'Arblay, who had been driven to England by the Revolution in France. Although her third story, "Camilla," brought her the great sum of $15,000, it is not so good as her others, and her last novel, "The Wanderer," earned $7,500 for her, yet it also does not compare with the first two.

Madame D'Arblay, as, of course, Fanny Burney was called after her marriage, did a great service to literature by showing how to write a story that could illustrate both the high and the low life of the day in simple, unaffected language, pure and wholesome in tone, and yet true to life. Her diary and letters fill many volumes, and are almost as famous as her novels, so that we see a "little dunce" may sometimes be only another term for a genius. Madame D'Arblay died on January 6, 1840.

Not many men have so large a family as twenty-two, but Doctor Charles Burney, the father of Fanny, was his father's twenty-second child, and, curiously enough, Maria Edgeworth, the next famous woman writer, was one of

Fanny Burney

Maria Edgeworth

Jane Austen

Jane Porter

Mary Mitford

Mrs. Gaskell

Charlotte Brontë

twenty-two children. She was born on New Year's Day, 1767, at Black Bourton, near Oxford, and although we usually look upon her as an Irish woman, because most of her long and useful life was passed in Ireland, she was of pure English descent. She describes herself as "a New Year's gift" to her father, and between the two there was a lifelong affection, as they were almost inseparable. Her mother died when Maria was a child, and her father married three times afterwards, so that Maria had three stepmothers, with whom she seems to have lived happily.

From her earliest years Maria had a passion for story-telling, but she does not appear to have written so much as Fanny Burney did. Certainly, there is no record of her having to make a bonfire of her childish scribblings. We are told that when she was thirteen she wrote a story called "Generosity," of which her father said: "It is excellent and extremely well written, but where's the generosity?" When she was fifteen, her father settled in Ireland, where he had a beautiful house called Edgeworthstown, and there, with a fine library to roam through, the girl had every encouragement to engage her literary tastes. Her father, a very clever man, helped her with her early writings, though these are the least important of her works. Unlike Fanny Burney's stepmother, Richard Edgeworth recognized his daughter's ability. When she was a young woman of twenty-four, he urged her to write anecdotes of the children he was educating, and the first book they wrote together was called "Practical Education."

She wrote many stories and essays, of which the chief are "Castle Rackrent," "The Absentee," and "Ormond," all of which describe life in Ireland in a vivid and truthful way, though they have the fault of being inclined to sermonizing. Sir Walter Scott was a great admirer of her works, and, indeed, her sound common-sense was approved by all the great people of her time. Whenever she went to London, she was a centre of literary interest, and although rather a plain woman, all who knew her seem to have been delighted with her character. In 1823 she made her memorable visit to Sir Walter Scott at Abbotsford, and her long life came to an end on May 22, 1849. It is worthy of note by those who suppose that, as we grow old, the time for learning has passed, that Maria Edgeworth began to learn the Spanish language when she was eighty-two, only a few months before she died!

Jane Austen was the name of one of the greatest and earliest story-tellers. She was born on December 16, 1775, at Steventon, in Hampshire, where her father was the rector. This quiet old rectory was her home for twenty-five years, and Jane, the youngest of a family of seven, all

Emily Brontë

Anne Bronte

"George Eliot"

Mrs. Lynn Linton

Charlotte M. Yonge

Mrs. Craik

Mrs. Oliphant

the rest of whom were boys, had the advantage of receiving from her father, who took pupils for instruction, an education as good as any of her brothers.

JANE AUSTEN, THE CLEVER GIRL WHO BECAME A GREAT WRITER

Indeed, Jane Austen was quite exceptionally educated for a woman of the time, and we have to bear in mind that a hundred years ago English people, as a whole, were not so well instructed as they are to-day. Even the wealthy people of the country were very badly educated, and the clergyman was very often the only person of any learning in his village. Jane Austen's father was once addressed by a rich squire to this effect: " You know all about these things. Do tell us. Is Paris in France or France in Paris, for my wife has been disputing with me about it ? "

Jane was a great reader; all the best-known writers of English literature were known to her. French and Italian she knew also; but she was by no means a girl who neglected household duties to pore over her books. She seems to have been in every sense a healthy, happy, and beautiful country maiden, with a singular gift for telling stories. As soon as she could write, she began to practise the making of tales, and later, when she set herself in real earnest to write long stories which were to be printed and sold everywhere, she found it so easy to compose her tales that she could go on writing them even with visitors in her room, to whom she would talk from time to time. We see her at her desk in the picture on page 2619.

WHAT THE GREAT SIR WALTER SCOTT SAID ABOUT JANE AUSTEN

Her first story was called " Sense and Sensibility," and was one of three fine novels which she wrote at Steventon between the ages of twenty-one and twenty-three, although it was not printed until 1811, when she was thirty-six. The other two were "Northanger Abbey" and " Pride and Prejudice." The last, together with two other fine stories—" Mansfield Park " and " Emma "—were published during her lifetime, but " Northanger Abbey " and " Persuasion," which complete the list of her books, were not printed until after her death, July 18, 1817. Her name was not given on any of her novels until after her death, so that she enjoyed but little of the great fame she might have won in her lifetime; but her name will live as that of one of the great novelists, for no one has excelled her in describing the quiet country life and the character of country people in England a hundred years ago. Sir Walter Scott read " Pride and Prejudice " three times with great delight, and said of Jane Austen: " The big bow-wow I can do myself like anyone going, but the exquisite touch which renders commonplace things and characters interesting, from the truth of the description and the sentiment, is denied to me. What a pity so gifted a creature died so early ! "

Women were now venturing more and more to come forward as story-writers, and instead of it being thought a disgrace for a young lady to write a romance, as in the days of Fanny Burney, people were perhaps too ready to see merit in a story that had been written by a young woman.

JANE PORTER, WHO WROTE THE STORY OF " THE SCOTTISH CHIEFS "

Perhaps that was why Jane Porter, who was born at Durham in 1776, could have become famous in 1803 by writing a high-flown romance entitled " Thaddeus of Warsaw." It is certain that the book would not attract so many readers to-day, and when we look into it, it is difficult to believe that many thousands were delighted by it a century ago. The Grand Duke of Würtemberg even conferred a distinction on its author by making her a canoness of the order of St. Joachim! Just as fashions change, so does the taste for reading, and our great - great - grandparents were simpler-minded than we are to-day, and perhaps easier to please. Jane Porter wrote another book entitled " The Scottish Chiefs," which has often been reprinted, although its hero, Sir William Wallace, cuts an absurd figure compared with the scores of splendid historical characters that appeared in Scott's novels.

Jane Porter was really a celebrated novelist years before Scott wrote " Waverley," and the fact that people immediately turned with delight to the stories of Scott shows that they only read Jane Porter's for lack of better ones. Her sister, Anna Maria, also wrote a great many novels, and her first book, entitled "Artless Tales," was published when she was only thirteen; but she does not rank among the women writers of note, and Jane Porter herself, who died May 24, 1850, is chiefly interesting because of the fame which she won in her own day, and not because of any enduring merit in her stories.

Mary Mitford, the daughter of a spendthrift physician, was born at Alresford, in Hampshire, on December 16, 1787, and began her literary life by publishing a book of poems when she was twenty-three. She wrote plays for the stage and charming sketches of country life. The best of her writings are gathered into the book called "Our Village." When Mary was ten her father bought her a lottery ticket which won $100,000; but he managed to squander the money, and Mary had to write for her living. She died in January, 1885.

Mrs. Gaskell, whose maiden name was Elizabeth Cleghorn Stevenson, was really the first notable woman writer born in the nineteenth century. She was born on September 29, 1810, at Cheyne Row, Chelsea, a place that is famous in literary history. Elizabeth was brought up by an aunt at the charming old-fashioned town of Knutsford, in Cheshire, which she was to make famous by describing it as "Cranford," in her novel of that name. We are told that she was noted as a girl for her sweet disposition as much as for her beauty, and at twenty-two she married a minister, and went to live in Manchester, where the rest of her life, so busy and useful, was spent.

Mrs. Gaskell was thirty-eight when she published her first novel, "Mary Barton." Unlike most of the other story-tellers about whom we have been reading, she did not write of men and women until she had studied them thoroughly, and what she wrote of them was not so much from her imagination as from her observation.

She wrote many other stories, all full of quiet charm, but she is also famous for having written one of the best biographies we possess, in "The Life of Charlotte Brontë," about whom we are presently to hear. This was a very difficult task, and Mrs. Gaskell fulfilled it admirably; but, unfortunately, she was so disappointed by the complaints of different people then alive, who disapproved of it for personal reasons, that she determined no biography of

FANNY BURNEY DESTROYING THE MANUSCRIPTS OF HER EARLIEST STORIES herself should ever be written, and left strict instructions to this effect when she died at Alton, on November 12, 1865.

The next woman story-writer of note who was born after Mrs. Gaskell bore a name in later life which is familiar all over the English-speaking world, and yet she was not a great writer at all. Her maiden name was Ellen Price, and she was born at Worcester, on January 17, 1814. All her life she was delicate. As a girl she does not appear to have been particularly fond of writing stories, giving no sign that she might ever become a popular author. She married a ship-agent named Henry Wood, and went to live in France; but her husband died while he was still a young man, and Mrs. Henry Wood, after she settled in London, decided to occupy herself by writing.

She was forty-six years of age before her first book was published, and it is interesting for boys and girls to know that this book, of which hundreds of thousands have been circulated, was written by her for a prize offered by a temperance society. The story is called "Danesbury House," and the year after it appeared Mrs. Wood wrote another story, which immediately became the most widely-read book of the day. This was "East Lynne," an improbable and needlessly tearful story; but as a great many people seem to enjoy having their feelings harrowed by stories of suffering and woe, "East Lynne" has had an enormous popularity for over half a century, both as a story and as a play; yet neither it, nor any of the books which Mrs. Wood afterwards wrote, can be described as real literature. Mrs. Wood died in London, on February 10, 1887.

THE THREE BRONTË SISTERS WHO WROTE SEVERAL FAMOUS BOOKS

We come now to three sisters whose names are among the most famous in the story of English literature in the nineteenth century. They have all been dead for more than sixty years, and none of them enjoyed long life. Indeed, the idea that great activity of the mind often goes with frailty of the body, and may sometimes be the result of the latter, has some support in the lives of the three sisters Brontë. The eldest, Charlotte, was born at Thornton, in Yorkshire, on April 21, 1816, and died

MARIA EDGEWORTH VISITING SIR WALTER SCOTT AT HIS HOME AT ABBOTSFORD

THE BRONTE SISTERS WRITING THEIR FAMOUS STORIES IN THE RECTORY AT HAWORTH

at Haworth, a village on the Yorkshire moors, on March 31, 1855. Emily lived from August 20, 1818, till December 19, 1848; and Anne, from March 25, 1820, till May 28, 1849. It will be seen from those dates how short were the lives of these three remarkable women; but, short as their lives were, their names will be famous for the work they contrived to do, despite the sorrow and hardship it was their fate to endure.

WHAT SORROW AND TROUBLE CAN DO FOR LITERATURE

Some of the finest works of literature have been the outcome of sorrowful hearts, and perhaps unhappiness has really done more in urging men and women to enlighten their fellow-men than happiness has done. Possibly, had these three women lived happy and comfortable lives in pleasant surroundings, strong in health and well supplied with money, the world would never have heard of them, and we should never have had Charlotte's great stories, "Jane Eyre," "Shirley," and "Villette," or Emily's wonderful romance of "Wuthering Heights," or Anne's story of "Agnes Grey," though the last is by no means so great a book as the others. The three girls were motherless, and their father was a gloomy and reserved pastor of a moorland village, with insufficient means to provide them with comforts. The people around them were chiefly of a rough and common class, and they were driven into their own companionship, studying and sorrowing together, and learned to write.

All were frail of body, for the seeds of tuberculosis, which had carried off two other sisters in childhood, were in each of them, and were very soon to take the three sisters in swift succession to their graves. All their knowledge of the world was obtained from a few short years at boarding-schools of the period, which were none too well conducted, but Charlotte and Emily had two years at school in Brussels, the capital of Belgium, the story of which is largely told in "Villette." Their highest ambition in those days was to become governesses, for which their gentle and sensitive natures did not fit them. Their first effort in the way of literature was a little volume of poems, published in 1846, which attracted little attention.

Each of the sisters took the name of "Bell," Charlotte calling herself "Currer Bell," Emily "Ellis Bell," and Anne "Acton Bell." When they next tried to win success by writing prose stories they kept those names, so that, a year later, when Charlotte's romance of "Jane Eyre" won success, many people believed it to be written by a man. It is difficult, however, to imagine why anyone who has read it could think a man would have been able to express so wonderfully the mind and character of a young woman.

THE END OF THE SAD STORY OF THE THREE BRONTË SISTERS

The fame which came to Charlotte and her sisters was very soon to be shadowed by death, for Emily passed away the year after "Jane Eyre" was published, and Anne followed her to the grave in five months' time. The hand of Death was on the lonely vicarage, as the only brother had died three months before the death of Emily. Charlotte was now alone with her aged and gloomy father. The literary world would have made much of her, but her life was too much overcast with sorrow to enjoy all the fruits of the success which her pen had won, and to go on writing was all that remained to her. Her last days were a brief happiness as the wife of her father's curate, Arthur Bell Nicholls, whom she married less than a year before her death.

When the Brontës were little children away on the Yorkshire moors, another little girl, whose name was Marian Evans, was playing about the farmhouse of Griff, near the town of Nuneaton, amid the sunny fields of leafy Warwickshire. She had been born on November 22, 1819, at Arbury Farm, where her father, who was the land-agent on the beautiful estate of Arbury Hall, was then living.

THE SCHOOLDAYS OF THE GIRL WHO WON FAME AS "GEORGE ELIOT"

Marian went to school at Nuneaton in a plain little schoolhouse which still stands beneath the shadow of the old parish church, but later she was at a boarding-school in the historic town of Coventry, and there, as a girl in her "teens," the preaching of some evangelist made a great impression on her, so that she began, while still young, to think seriously of life. She had a great love for her mother, who died when Marian was seventeen; her elder sister passing away a year later, Marian became the housewife of Griff Farm at eighteen.

But she was no ordinary mistress of a farm, for she had teachers of German, Italian, and music, who came over regularly from Coventry to give her lessons in these subjects, so that she became an accomplished scholar in languages, and was always a passionate musician. The long leisure of country life was also a boon to her, for she was a great reader, and there can have been few women of her age so widely read as Marian Evans. When she was twenty-two she went to stay with her father at Coventry, and there she began her first literary work, translating from the German a famous "Life of Jesus." She stayed at Coventry until the death of her father, which took place in 1849. She then traveled abroad for some time, and in 1850 settled in London as a writer and translator.

GEORGE ELIOT'S FIRST STORY AND HER OTHER FAMOUS BOOKS

So far she had done nothing that would have made her famous; but she had rather the mind of a man than of a woman, and her bold and courageous views of life soon made her the centre of a literary circle in the great city, or, indeed, wherever she went. She was thirty-seven when she attempted her first story, "The Sad Fortunes of the Rev. Amos Barton," which was published in "Blackwood's Magazine." This was one of the stories afterwards published as "Scenes of Clerical Life," in which, with remarkable genius, she made use of many living characters in and about Nuneaton.

All who had taste for good literature realized at once that a new writer of great power had arisen, and as she now signed herself by the name, "George Eliot," anyone might have been excused for thinking that the stories were the work of a man, so strong and true was the grasp of character, so deep the insight into human nature. No English woman had ever before and none since has shown such power. Her most famous book, "Adam Bede," was published when she was forty, and she wrote many others before she died at Chelsea, on December 22, 1880. Some of these, such as "The Mill on the Floss," "Silas Marner," and "Romola," rank among the greatest of English novels. It may be said of George Eliot that she enlarged the scope of the English novel, and proved to the world that a story can be at once a source of pleasure and entertainment, and yet full of the wisdom of life and a help to the understanding of human nature.

All the other women writers of the nineteenth century that call for notice here are far below the Brontës and George Eliot in their gifts of mind and their literary power. Mrs. Lynn Linton, who was born on February 10, 1822, and died on July 14, 1898, enjoyed a long and useful life, during which she wrote many stories and essays. She was a lady of great personal charm, and in every way the model of a self-reliant, courageous woman of the old-fashioned type, but her stories are not likely to engage the readers of a later generation. Mrs. Linton knew George Eliot, and among the last of her writings were some reminiscences of that famous woman.

MISS YONGE'S STORY "THE DAISY CHAIN," AND HOW IT BUILT A COLLEGE

Miss Charlotte M. Yonge was a story-writer of much the same standing as Mrs Linton. She is famous for her story "The Heir of Redclyffe" and her book of Golden Deeds, and she wrote altogether some 120 volumes of fiction, most of which were very successful. She was greatly devoted to missionary work, and part of the profits of the story just mentioned were devoted to fitting out a missionary schooner for cruising in the South Seas. Another of her books, "The Daisy Chain," brought $10,000, and this large sum of money she gave to build a missionary college in New Zealand. Miss Yonge was born on August 11, 1823, and died on March 24, 1901.

A more notable writer than either of the last two named was Dinah Maria Mulock, author of "John Halifax, Gentleman," who was born at Stoke-upon-Trent, on April 20, 1826. This lady went to London and wrote a number of successful stories before she was thirty years of age; but "John Halifax" is her most notable achievement, and few novels of the nineteenth century have been more widely read. She also wrote many poems worthy of remark, and was a clever essayist, but she will always be remembered as the creator of John Halifax. Some twenty years before her death, which took place on October 12, 1887, she married Mr. Craik, and she is more often spoken of as Mrs. Craik than under her maiden name.

A BRAVE SCOTSWOMAN WHO KEPT HER FAMILY BY HER WRITINGS

Another delightful woman story-writer, who resembled in many ways Mrs. Lynn Linton, was Mrs. Oliphant. Although she does not rank with the highest, she wrote many stories of much charm, and a number of fine books of an historical character. The story of her own life would be quite as interesting as any in a novel, for she was a brave and good woman who, after her husband's death, earned a livelihood for her children with her pen. How much she had to fight against we can guess, from these words written by herself: "When I thus began the world anew I had for all my fortune about £1,000 of debt, a small insurance of, I think, £200 on Frank's life, our furniture laid up in a warehouse, and my own faculties, such as they were, to make our living and pay off our burdens by." But with the courage of her hardy Scottish ancestors—she was born near Musselburgh, in 1828—she set herself to the task, and, often struggling with a heavy heart on account of the illnesses of her children, she plied her pen at story-telling and in writing for the journals. Mrs. Oliphant died at Wimbledon, June 25, 1897.

THE REAL NAME OUT OF WHICH "EDNA LYALL" WAS MADE

Only one more writer of note need be mentioned here. Edna Lyall, who was born at Brighton, in 1859, and died at Eastbourne, on February 8, 1903, was a woman novelist of real power and sincerity, whose many books, which were widely read and are still popular, have done good. Her real name was Ada Ellen Bayley, and the name under which she wrote was made from it.

Of course, there were many other women story-tellers whose books were popular, more or less, and there are many others still alive who enjoy fame as great as some of those of whom we have read here; but those we have chosen may fairly be described as the most noteworthy of the English women writers up to the end of last century.

The photos of Mrs. Linton and Miss Yonge on page 2621 are by Elliott & Fry; those of Mrs. Craik and Mrs. Oliphant by Mendelssohn.

THE NEXT STORIES OF MEN AND WOMEN BEGIN ON PAGE 2711.

ROBIN HOOD AND HIS MEN STORM A CASTLE

Wonderfully courageous were the merry men of the greenwood under their valiant leader, Robin Hood. Here we see them attacking a castle, effecting an entrance over some tree-trunks thrown across the moat.

Robin Hood's charity

Robin Hood as a potter

Robin Hood as a beggar

ROBIN HOOD AND HIS MERRY MEN

CONTINUED FROM 2404

ONE day, when Richard Cœur de Lion was King of England, there walked in the beautiful green forest of Sherwood a handsome youth and a beautiful maid who were lovers plighted to be wed. The youth was Robert, son of the Earl of Huntingdon; the maid was Marian, daughter of the Earl of Fitzwalter. They both loved the greenwood; they both shot exceedingly well with the bow; and the maid was as swift to mount and ride a horse as was the handsome youth at her side. As they walked hand in hand down the green glades of the forest, Robert spoke of the merry days that lay before them, and Marian laughed to think of the great joy that was coming to her. They were happy lovers, a boy and a girl who thought of life as a delightful summer ballad.

But a terrible thing happened. The King was in Palestine, and his wretched brother, John Lackland, ruled the kingdom. He oppressed those who opposed him, and among those whom he ruined was the Earl of Huntingdon. Poor, brave, happy Robert saw in a single day his father killed, his home destroyed, his estates seized, and himself made a homeless and beggared outlaw.

He escaped from the soldiers of John, and, plunging into the thick forest of Sherwood, with his bow, threw himself down upon the green earth and wept for the ruin that had so suddenly overtaken him.

When morning came, he took counsel with himself and planned how he should live his life. The night in the open air had been sweet to him; the sunrise breaking and glittering through the fragrant branches had roused him in the first flush of dawn; he drew the scented cool air into his lungs, felt the glory of the day caress him, and saw that the greenwood was a fair world.

"Since John has made an outlaw of me," he said, "I shall take this good forest for my estate. I shall feed upon the King's venison, and call myself Robin of Sherwood."

He wrote a sad letter to Maid Marian telling her of all his misfortunes, and setting her free of her vow, since he could not ask a great lady to share his outlaw's life in the forest. It cost him many a sigh to send this letter. It was hard for him to give up his happiness, and he felt sad and lonely in the depths of the great deep wood. But his solitude was soon broken.

Brave men who had served his father, the Earl, came into the forest with their bows and arrows and swore that they would spend their days with Robin. They refused to live under the Normans; they would be outlaws, they said—free, merry men of the greenwood, and Robin should be their king. And they lived in the forest near Nottingham, which Robin sometimes visited disguised as a beggar or tradesman.

Thus it happened that Robin became the chief of a band of stout English, who feared no danger, courted adventure like a maid, and loved a jest. This company soon arranged how they should live. In those days, when roads were hard to find, people traveled on horseback, and many a plump abbot and covetous merchant went by the forest with their saddle-bags stuffed with gold. Robin declared that he saw no wrong in relieving these people of their baggage, since they only lived to rob the poor; he would treat them with kindness, he said, but he would help himself to their money. Disguised as a friar one day, for instance, he despoiled two fat monks of their money-bags, and kept them on their knees praying for two hours. As for the poor and needy, no man of his must lay a finger upon them; nay, out of the spoil wrung from the rich they must help these poor and make them glad and happy.

" You shall be sworn," said bold Robin Hood,
" Upon this holy grass,
That you will never tell lies again,
Which way soever you pass."

Once Robin played an amusing trick on a tinker who said he had the King's warrant to arrest the famous outlaw. Robin told him he would find him in Nottingham, and offered to help him. When they came to the town he gave him so much ale that he fell asleep, and Robin walked off and left the tinker to pay the bill.

In this way Robin lived cheerfully. His fame spread through all the country. People whom he stopped and robbed told strange stories of how they had been carried far into the forest, treated to a feast worthy of a king, used with all courtesy and kindness, and after having " paid for the entertainment " had been pleasantly led forth and set upon their road again.

They told how Robin had dressed all his men in suits of Lincoln green; and how these cheerful fellows sang the old English ballads, and made great sport with the bow; and how one of their members called Little John was seven feet tall, another a very small and squat man named Much, and a jovial, fat priest of the Church named Friar Tuck, and how Robert was called not Robin of Sherwood, but Robin Hood, and was like a king among his merry men. No wonder that, as these stories spread about the world, the Sheriff of Nottingham felt that he must catch Master Robin and hang him for a rascally outlaw not fit to live.

The outlaws, however, ran great risks, and Little John even became a servant in the house of the Sheriff himself, where he played several tricks on a greedy old butler, finally knocking him over and running off to the forest with the silver plate of the Sheriff. Some time after the outlaws ventured into the town again to compete in an archery contest held by the Sheriff for a silver arrow. Robin won the prize, but the Sheriff tried to arrest him, and in the strife that ensued Little John was wounded, and the outlaws escaped only with great difficulty, little Much bearing big Little John for some distance on his back.

As Robin rode through the forest one day he came upon a young knight, and challenged him. They fought together and the knight was wounded. Then Robin, like a true man, knelt beside him to give him aid, but when the poor youth removed his helmet, lo, it was no knight! It was Maid Marian. Robin cried out with grief for having wounded her; but when he saw that the wound was not deep, and learned that Marian had come in search of him, he was glad, and embracing her most tenderly, he led her to the Trysting Tree. Here he blew upon his horn; his men came from every part of the forest, and when they had heard the story they offered obedience to Maid Marian as their queen, and the jolly old Friar Tuck came rolling up with his book under his arm and married Robin to Maid Marian there in the glades of the forest.

He gave the butler such a rap
His back nigh went in two,
Though he lived an hundred winters
The worse for it he would go.

One day Robin stopped an unhappy youth named Allan-a-Dale, and learned that, after waiting long for the beautiful woman who loved him, her wretched, miserly old father had promised her in marriage to an ancient, hideous, but rich man, old enough to be her grandfather. The marriage was to take place on the morrow, and poor Allan-a-Dale was broken-hearted. Robin bade him cheer up, and on the morrow he set off for the church, with his merry men following behind, and in the midst of the ceremony stopped the Bishop of Hereford, who was reading the service, and, blowing upon his horn, summoned all his merry men, with Allan-a-Dale and Friar Tuck in their midst.

So while the tinker fell asleep,
Robin made haste away,
And left the tinker in the lurch
For the great shot to pay.

"This bridegroom is too old," said Robin Hood; and then, addressing the bride he said, "Lady, look round and see if you cannot find one more to your choice."

Of course she chose Allan-a-Dale, and then and there Friar Tuck married them.

On another occasion Robin exchanged clothes with a potter, took his cartload of pots and sold them in the market place at Nottingham; and on yet another occasion he stopped a butcher who was riding with panniers of meat into the market, and, changing clothes with him, set out for the very town where the Sheriff lived who had sworn to lay him by the heels. The streets were crowded, and Robin amazed everybody by selling his best beef at only twopence a pound. The Sheriff heard of this strange young butcher and his doings, and at the market feast seated him at his side.

"I shall get money out of such a simpleton," thought the Sheriff, who was a miser. Robin could scarcely help laughing to find himself sitting in the place of honor beside his great enemy. The Sheriff asked if Robin had a big farm.

"Hundreds of acres," answered Robin, smiling to himself.

"And much cattle?"

"Hundreds and hundreds of the finest horned cattle."

"Do not speak so loud," mumbled the cunning old Sheriff; "but tell me how much you would take for your acres and cattle!"

"Three hundred pounds," said Robin.

The Sheriff arranged to ride out very early next morning with this very silly young butcher. They rode on till they approached Sherwood Forest.

"A bad man lives here," said the Sheriff. "Do you think we shall meet him? Robin Hood is his name."

"Oh, I am sure we shall not!" answered Robin, laughing.

Just then a hundred head of good fat deer passed in front of them.

"There go my horned cattle," laughed Robin. "What do you think of them? Are they not good?"

The Sheriff rode back to Nottingham late that night with no farm, no horned cattle, and without the £300 ($1,500) which he had brought with him for their purchase from the simple butcher.

Another of Robin's enemies was the Bishop of Hereford, who had never forgiven Robin the matter of Allan-a-Dale's marriage. He came riding into Sher-

The butcher he answer'd jolly Robin,
" No matter where I dwell;
For a butcher I am, and to Nottingham
I am going, my flesh to sell."

Up he took him on his back,
And bare him well a mile,
Many a time he laid him down,
And shot another while.

One of his best arrows under his belt
At the friar he let fly;
The curtal friar, with his steel buckler
Did put that arrow by.

wood Forest one bright summer day with a company of soldiers carrying money to a distant monastery. He hoped to capture Robin on his way, and carry him prisoner to the Sheriff of Nottingham. As luck would have it, Robin was straying alone about the forest that day, listening to the blackbirds and thrushes, and enjoying the sweet scents of briar rose, honeysuckle, and bracken.

Before he knew it, the Bishop's soldiers saw him, and charged down upon him. Robin took to his heels. He dodged behind trees, crept along ditches, and ran down the narrowest glades. The horses of the soldiers tripped and stumbled, throwing their riders to the ground. Robin ran hard till he reached the cottage of a poor woman. He changed clothes with her, and promised that if she remained still, and let the Bishop capture her, no harm of any kind whatever should befall her.

As soon as she knew that she could serve Robin Hood, and do a bad turn to the wicked Bishop, who oppressed the poor, the old woman was glad. So Robin hobbled off, and the soldiers took no notice of him; but they went to the cottage, captured the dame, in Robin's Lincoln green, and carried her away. Not very far had they gone, however, before Robin stood in their way with all his bowmen ranged on every side of them. The soldiers laid down their arms, and the Bishop had to deliver up all his treasure.

" It belongs to the Monastery of St. Mary," said the Bishop.

" Nay," answered Robin; " it belongs to the poor, from whom you have filched it, and to whom it shall now return."

Then he made the Bishop celebrate High Mass; and all his men praised God among the trees in the forest.

On one occasion Robin lent a poor knight a sum of £400 ($2,000) wherewith to pay a selfish abbot who had lent it to him. The knight arrived at the abbey only just in time, and found the abbot laughing and eating heartily in company with a justice of the peace whom he had invited to dine with him and arrange for the transfer of the knight's broad acres to the abbey.

The knight, to the abbot's disgust, paid up the four hundred pounds, upbraided him for his greed, and rode away home, blessing the kindness of Robin Hood.

A stout and long encounter, too, had Robin with giant Friar Christopher, of Fountains Abbey. He shot all his arrows at him, but the friar stopped them all with his shield, and they then fought hard with swords until they became great friends, and the friar went off with Robin Hood and his merry men into the greenwood.

Such stories as these came to the ear of King Richard when he returned from the Holy Land, and he determined to see Robin Hood. But though he rode many times in Sherwood Forest he saw nothing of Robin or his merry men. He was then advised to put on the dress of a monk, and so disguised he traveled through the forest, and Robin seized him, though the King gave him a blow that sent him sprawling on the ground. The King was treated fairly, and given a feast, and in the midst of it he showed his ring to Robin, and said that, though a monk, he was a messenger of the King. At the name Robin and all his men stood up, uncovered, and cried with one voice: "God save King Richard!"

The King then disclosed himself, and Robin knelt and kissed his hand. So pleased was the King with this loyalty, and so struck was he by Robin's kindness, that he gave him a free pardon. Robin and his merry men followed the King to London, and there they feasted and had great cheer.

But when Richard died, and John succeeded to the throne, Robin and his merry men had to fly once more to the forest. They were not very sorry, for they loved the wild life of the greenwood, and they were not afraid of John while they had the familiar forest for a kingdom of their own.

The years passed, and Robin grew very ill, and when he watched the young men shoot he grew very sad at heart. He said he thought he would go and visit his relative, the Abbess of Kirkley, in Yorkshire. Little John, very grieved at his master's sickness, bore him thither. He wanted to be near his master and nurse him; but the Abbess would not hear of this, and bade him wait in the garden. Then she made a wound in Robin's arm to bleed him, but, instead of tightly bandaging the wound, this woman, who, in her heart, hated Robin for his robberies of monks and priors, loosely knotted the linen, and went out, locking the door behind her. So Robin lay alone bleeding to death, and the faithful Little John stayed in the garden of the abbey gazing up at his beloved master's window.

Twilight fell upon the garden. Presently three soft notes sounded faintly upon Robin's horn.

"He must be dying to blow so weakly!" cried Little John, and started up. He ran up the stairs, reached the door, burst it open, and rushed in to embrace his master.

"I am dying," said Robin, and swooned in his arms.

He took him to a board anon,
To a table round,
And then he shook out of a bag
Even four hundred pound.

And such a buffet he gave Robin,
To ground he went full near;
"I do avow to Heaven," said Robin.
"Thou are a stalwart frere."

Robin saw some young men shoot
Full fair upon a day,
"Alas, alas!" said good Robin,
"My joy is gone away."

After a moment he roused himself. "Give me my good bow and an arrow," he said. He took the bow, and went to the window. "I will shoot once more," he said, "and where the arrow falls, there let me be buried."

He was so weak that the arrow fell but a little way into the ground.

"A good shot! A good shot!" cried Little John, with his eyes full of tears.

"Was it a good shot?" demanded Robin eagerly. "Really a good shot?"

"'Twas a good shot, master."

Then Robin said:

Lay me a green sod under my head,
  And another at my feet,
And lay my bent bow by my side,
  Which was my music sweet;
And make my grave of gravel and green,
  Which is most right and meet.

Let me have length and breadth enough,
  With a green sod at my head,
That they may say when I am dead,
  Here lies bold Robin Hood.

As he lay swooning in the arms of Little John, he suddenly roused himself, and looked earnestly forth from the priory window towards the gathering darkness of the night.

"Was it," he whispered hoarsely, straining his eyes, while his heart throbbed and shook his frame, and his soul passed away—"was it a good shot?"

A PAIR OF MAGIC SLIPPERS

IN the old coaching days, when everybody traveled by road, the innkeepers were a race of busy men. Certainly, Sandro Reni, who kept an inn on the highway between Siena and Florence, was the busiest man in Italy. His inn was always crowded with travelers, and all the work fell on his shoulders. His wife died, leaving him a little daughter named Nina; and as he found that he could not get on without a helpmate, Sandro married again. Little help, however, did he get from his new wife. She was a very beautiful creature, but she was as idle and as vain as she was beautiful. And, unhappily, the fame of her great beauty spread far and wide, and this made her still idler and more vain. Whenever travelers came to the inn, she used to show herself off, and say:

"Have you ever seen anybody more beautiful than I?"

At first they replied that they had not; but at last, as Nina grew up, and became also very lovely, they said:

"Well, your little stepdaughter, you know, is undoubtedly a very charming girl."

By this time, however, the woman's head had been turned by all the admiration she had obtained, and she could not bear to hear praise given to anyone but herself. She looked with spiteful and angry eyes at Nina, and said to herself:

"If I do not get that child out of the way, I shall lose all my fame."

She had received a great many jewels from her admirers, and she now sold half of these, gave all the money to two wicked and desperate men, and told them to take Nina to a distant forest and kill her, and bury her there. The two men carried Nina to the forest; but they were so touched by her innocence and beauty that they had not the heart to shed her blood, so they tied her to a tree and left her to starve.

There Nina remained for five days and four nights, but on the fifth night, just as all her strength had failed, a band of robbers gathered beneath the tree to share their spoils.

"Oh, great heaven!" cried the captain of the robbers, as the light of their fire fell upon the white dress of Nina. "An angel is watching us!"

The robbers fell upon their faces. Then, finding that the white figure did not move, the captain crept slowly up, and touched it.

"Why, it is a beautiful girl," he exclaimed. "Quick, cut the ropes! She is dying!"

The robbers took Nina to their cave, and kindly tended her, and when she recovered she told them her story.

"Well," said the captain of the robbers, "I think that it would not be wise for you to return home. Your stepmother would find some other way to kill you. Stay with us, and be our little housekeeper."

And this was what Nina did. She kept house for the robbers in the cave, and prepared their meals for them. In return they treated her as a little sister, and whenever they went to sell their spoils at Florence or Siena, they brought her jewels and fine dresses. But one day they stopped at Reni's inn, and his wife saw one of the dresses.

"Who is that for?" she said.

"For someone more beautiful than you," said the captain of the robbers.

The stepmother at once guessed who it was. She sold the other half of her jewels, and gave all the money to a witch, and got a pair of satin slippers from her. And the next time the captain of the robbers came, she said to him:

"Here's a pretty present for the pretty girl of whom you spoke."

The captain of the robbers took the slippers to Nina, and in the afternoon, when Nina was alone, she put them on. When the robbers came home at night, they found their little sister lying dead on the floor of the cave, and they could not understand how she had come by her death.

"Oh, how beautiful she is!" said the captain of the robbers. "Let us array her like a princess and make the cave her tomb."

So they made a couch in the middle of the cave, and placed Nina upon it, dressed in her jewels and a lovely robe, and they all went sadly away, and dwelt in another part of the forest.

Finding that the place was no longer infested with robbers, huntsmen in search of wild game began to come there, and one day the young Duke of Tuscany started a boar, which ran into the cave.

"Now I have the beast," he said. And he alighted from his horse, and entered the cave, and found Nina lying on the couch.

"Oh, what a miracle of beauty!" he exclaimed. "Surely she lives!"

But though he tried many ways to bring her back to life, she never moved, and at last, as night was falling, he prepared to leave.

"But I must have a keepsake," he said to himself.

He pulled off one of her slippers. Then, seeing in amazement that one of her eyes had opened, he pulled off the other slipper, and the other eye opened, and Nina rose up. In great joy, the young duke clasped her in his arms, carried her to his horse, and seating her on it, led her to his palace.

Nina opened her eyes and rose up, and the young duke clasped her in great joy.

After he heard her story, he had the stepmother and the witch and the two wicked men punished. But he pardoned the robbers, and took them into his service; and when the splendid wedding of the young duke and the lovely Nina took place, Sandro Reni became quite an important man in that country as father of the duchess.

THE FAIRIES OF ST. DAVID

A LONG time ago, Elidorus, a boy of twelve years of age, was punished by his schoolmaster, and he ran away and hid in a cave by the river, and there he remained without food for two days. Two wee men then appeared, and said:

"Follow us, and we will take you to the Land of Delight."

And Elidorus followed them through a dark passage down the earth, out into a rich and beautiful country. But there was no sun or moon or star there, only a strange twilight falling from a strange sky. The two wee men led Elidorus to their King, and their King made Elidorus the companion to his eldest son. All the people of the Twilight Land were very small, but they were very handsome, and they had long golden hair that fell over their shoulders. The King of the Twilight Land allowed Elidorus to go back through the dark passage and visit his mother, and one day Elidorus was telling her what a rich country he lived in, and she bade him bring her some of its treasures.

So, the next time Elidorus played with the son of the King, he stole a golden ball and ran with it to his mother's house. The two wee men, however, pursued him, and they tripped him up just as he got indoors, seized the golden ball from his hand, and departed.

Elidorus was very sorry that he had stolen the golden ball, and he wanted to beg the King's pardon, but the passage in the cave by the riverside was closed, and was never opened again to Elidorus.

THE LORD OF THE LIONS

SOME time ago a settler in Uganda brought with him a donkey, and one morning the donkey ran away into the open country. There he brayed so long and loudly that he roused a lion. The lion sprang up, and then stood still in astonishment. Was it safe to attack this strange, new animal with long ears?

"Who are you?" he said.

"The Lord of the Lions," said the donkey. "Didn't you hear my challenge?"

"Yes," said the lion. "But we need not fight. Let us enter into a league against all other animals."

So the two of them set out together, and they came to a river. The lion cleared it at a leap, but the donkey swam through it very badly.

"Why, you can't even swim!" said the lion.

"Swim?" said the donkey. "I swim like a duck. Didn't you see I caught an enormous fish with my tail, that nearly pulled me under? But you were so impatient that I let it go."

Soon afterwards they came to a wall. The lion jumped over, but the donkey got his fore feet across and couldn't get any further.

"What are you doing now?" said the lion.

"Can't you see?" said the donkey. "I'm weighing myself. I want to find out if the fore part of my body is as heavy as the hind part."

After a wild struggle the donkey got over, and the lion said:

"You've no strength at all. I shall fight you."

"Just as you please," said the donkey. "But let us first have a real trial of strength. When I'm by myself I never jump over a wall, I knock it down. Let me see you do that."

The lion began to pound away at the wall with his paws, but he bruised himself so badly that he had to stop. The donkey then kicked the stones furiously with his iron hoofs, and the old wall soon tumbled down.

"By jingo, you are strong!" said his companion, licking his wounded paws. "I will have you acclaimed Lord of the Lions."

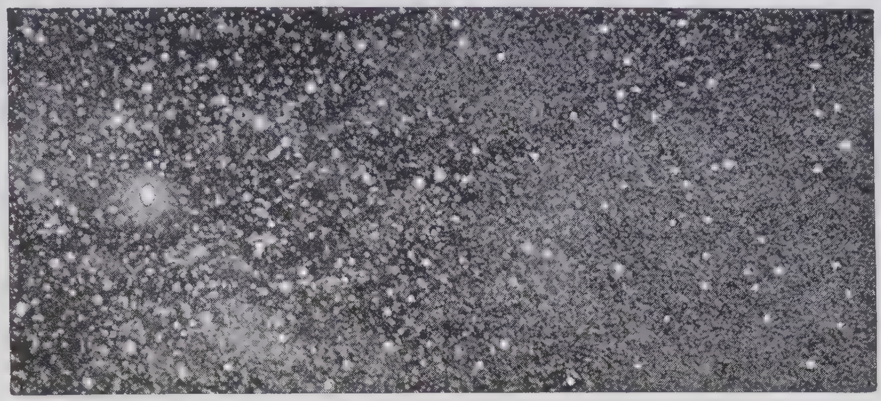
The next day all the lions of Uganda met together, and the donkey led them with a majestic air into a valley overgrown with great prickly thistles.

"Oh, don't go there, please!" all the lions cried in terror. "The prickles will get into our paws."

"Well, you are timid creatures!" said the donkey. "Now, look at me."

And, to the amazement of the assembly, he began to eat up the prickly plants. He was at once acclaimed Lord of the Lions, and as he never wanted any of the game which his subjects killed for food, he pleased them more than any other ruler they had ever had.

THE NEXT STORIES BEGIN ON PAGE 2749



THE STARS AS WE SEE THEM

CONTINUED FROM 2547

WE already know that the sun is one of the stars, which means that the stars are suns. This was seen by Giordano Bruno long before it could be proved as it can now. At the present time the most promising part of astronomy is based on this mighty truth, and one of the greatest observatories in the world—it is in America—is devoted to studying the sun as one of the stars, and to studying the stars as suns. Everything we learn now about the stars helps us to understand the sun—our star; and everything we learn about the sun helps us to understand the other stars.

But we must begin at the beginning. We know that the beginning of the study of the stars was very long ago, ages even before the invention of the telescope or any kind of instrument, when men had only a pair of eyes and a good brain behind them. The Assyrians and Egyptians, the Chaldeans and the Greeks, had no telescopes and few observatories, but they learned practically everything that was known about the stars until almost our own times. For, after all, anyone with eyes, who cares to use his eyes, can study the stars and learn a great deal about them.

The first thing men learned was that a few of the bright points in the sky, like stars, move about or wander among the other stars. These wanderers, or planets, we now understand; and we keep the name "stars" for all the rest, which for many ages were called the *fixed* stars, in order to distinguish them from the *wandering* stars. There are good reasons why we should drop the word *fixed*. It is not necessary, as we can call the wandering stars *planets*, and not stars at all; and it is not true, for we know that many of the "fixed" stars move, and we have reason to believe that they are all of them moving.

If we watch these stars, however, every clear night for the whole span of our lives, we notice no movement; and this is true of most of them, even though they are watched for generations or centuries. They seem to keep the same positions compared with one another, though the whole sky seems to have moved at different times of the year or at different times of the night. The winter sky, for instance, seen from our part of the world, is much more interesting than the summer sky.

Thus it happens that men's eyes naturally came to group the stars together, and these groups, we know, are called constellations. From night to night, or year to year, the stars making up a constellation remain in the same positions beside one another;

and so, if six form a sort of coronet, men call them the crown, and so on. The proper name for these six is the Northern Crown or Corona Borealis, and you can find it in the picture on page 2641—or, much better, in the sky. Borealis is derived from Boreas, the god who was supposed to blow the north wind. But it is most important for us to understand now what could not be understood long ago.

HOW MEN THOUGHT THEY WERE LIVING IN A BALL, WITH THE STARS STUCK ON IT

When we look at the sky it seems to be a sort of dome or bowl upside down —someone has called it "that inverted bowl we call the sky"—with all the stars stuck on it, at the same level or distance from our eyes; so that what we *see* as a group of stars would really *be* a group of stars, or a constellation. And astronomers actually thought that the stars were attached to a mighty sphere, inside of which we were, and that the movements of the sky as a whole were due to this great sphere or hollow ball moving round and carrying all the stars together with it. The planets, moving separately, had to have other supposed spheres or bowls invented for them, and we may guess how complicated and impossible the whole thing grew, for it was wrong from the first. It is as if you looked across your room and thought that everything was on the same level—at the same distance from your eye. A funny notion you would have of what your room really is! But actually you see the room *in perspective*, and you know that things which lie side by side in your field of view may be, one quite near and the other at the far end of the room.

THE IMMENSE DEPTHS IN THE SKY THAT WE CANNOT REALIZE

Unfortunately, we cannot see the sky in perspective. If we could—if we could get any notion at all with our eyes of the *depths* of space—much more than half of all the mistakes of astronomers could never have been made. Any boy could have corrected them the first time he was out on a fine night. Quite lately a clever Englishman has invented a way of giving us some idea of sky-perspective, or the depths of space. He has made pictures of the sky in the same way that things on the earth can be photographed as they are seen, first through one eye and then through the other. When looked at with both eyes through a stereoscope, or "solid see-er," these pictures give us a perspective of the sky, and we can see some stars as comparatively near, and others—which look just beside them in the sky—as shining through to us from the far depths of space. So now, perhaps, we shall understand, once and for all, that the constellations, or groups of stars, look as they do just because we see the sky on the flat, our eyes being unable to give us any idea of the tremendous depths through which the light of different stars is coming to our eyes.

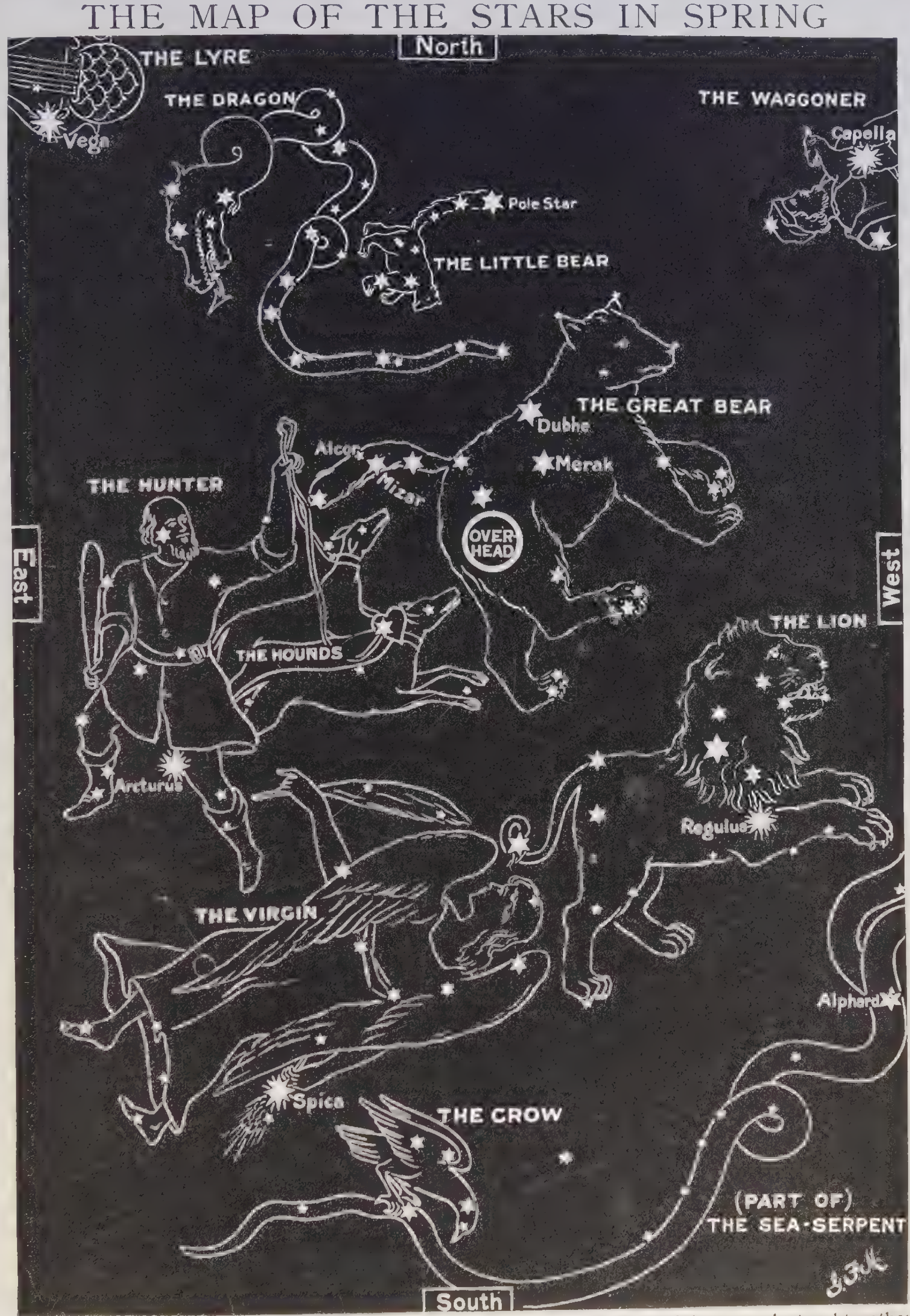
Nevertheless, of course we must learn the principal constellations, for they are the landmarks of the sky—or sky-marks, if you like—and they are always referred to when we want to say where to find a comet or a planet at any particular time. And here we may learn a very interesting thing. The "fixed" stars are not fixed, and therefore, as they move, the constellations ought to change. And so they do. The first astonishing fact about these changes is that, on the whole, they are so slight. We have names and records going back for ages; but, in general, the face of the sky is very much what it was when the study of the stars began.

THE CHANGES THAT TAKE PLACE SO FAR AWAY THAT WE CANNOT SEE THEM

Yet we now know that many of these stars are moving perhaps ten or even a hundred miles every second. This can only mean that the distances of the stars are enormous; for, of course, the nearer things are to our eyes, the greater is the visible effect of their movement, and vice versâ.

But the second fact is that, though the changes seem so small, considering how long the stars have been watched by mankind, yet there are changes. For one thing, we know certain constellations, or groups of stars, which the ancients did not name, and which have received names near our own time. Knowing how carefully the old astronomers watched, and how ready they were to give names, we may reasonably believe that the reason why they took no notice of these "new" constellations, as they are called, is that they were not there to be seen. The stars making them have moved in the sky, and the

THE MAP OF THE STARS IN SPRING



As we look at the sky at night and see the stars shining, we notice that most of them are clustered together in groups. These groups are called constellations, a word that means " stars together." Some constellations have curious names, because the people of ancient times named them after their gods, or after things which the stars were thought to resemble. As we look at these groups, it is impossible for us to see any resemblance to the things, but some modern astronomers suggest that perhaps the positions of many of the stars, as seen from the earth, have changed during the centuries, and that the groups did at one time resemble the creatures named. In these maps we see the outlines of the constellations as ancient people drew them.

To read these star-maps, stand facing the south and hold the map above the head with the top pointing north.

"new" constellations are therefore really new in the sense that, a few thousand years ago, the stars making them did not look like a group of stars, or a constellation, to the eye, as they do now.

Some of the names given to the constellations, suggesting that they look like things we know, may seem very absurd. Here, too, the fact that the stars are not really fixed may help to explain. It may be that, when the name was given, the stars were in positions that made the constellations look more like their names than some of them do now.

THE NORTHERN AND THE SOUTHERN HALVES OF THE SKY

If we consider how the earth turns in space, we shall understand that only the northern half or so of the sky can ever be seen from most of the United States. As it happens, this includes the more interesting and wonderful stars, though perhaps we may think so only because the great astronomers have all lived on the northern half of the earth, and there is only one first-class observatory—that of Cape Colony—on the southern half of the earth yet; so that we really do not know nearly so much as we should about the southern sky.

But everyone who lives in our part of the world should know, at any rate, a few of the finest constellations and stars that we can see without the use of any machinery except that by which the Greeks made such great discoveries in astronomy—a pair of eyes and a mind. The pictures show us what we really ought to know, and I shall here mention the principal stars that are shown. But the pictures do not show one thing which would interfere with their clearness, and that is the northern half of the Milky Way, the great belt of stars which runs right across the entire sky, all the way round.

THE QUEER NAMES THE ANCIENT ASTRONOMERS GAVE TO THE STARS

We all should know the seven stars that form the tail and part of the body of the Great Bear. These seven stars look very like a dipper, and are often called the Dipper. When we see them we can always find the Pole Star, by following up the line made by the "pointers," Dubhe and Merak. Look straight at the Pole Star and that is the *north.* Now go back to the Great Bear, and follow the course of his tail downwards and backwards, until you come to the magnificent star Arcturus. This is one of the brightest stars, which are called "first magnitude" stars. *Magnitude* is Latin for bigness. Arcturus is one of the most rapidly moving of all the flying stars, and is believed to travel about one hundred miles every second.

Another easily-seen constellation looks very like a big W, ˙∴˙, in the sky, and is called Cassiopeia, the lady in the chair. It can never be mistaken.

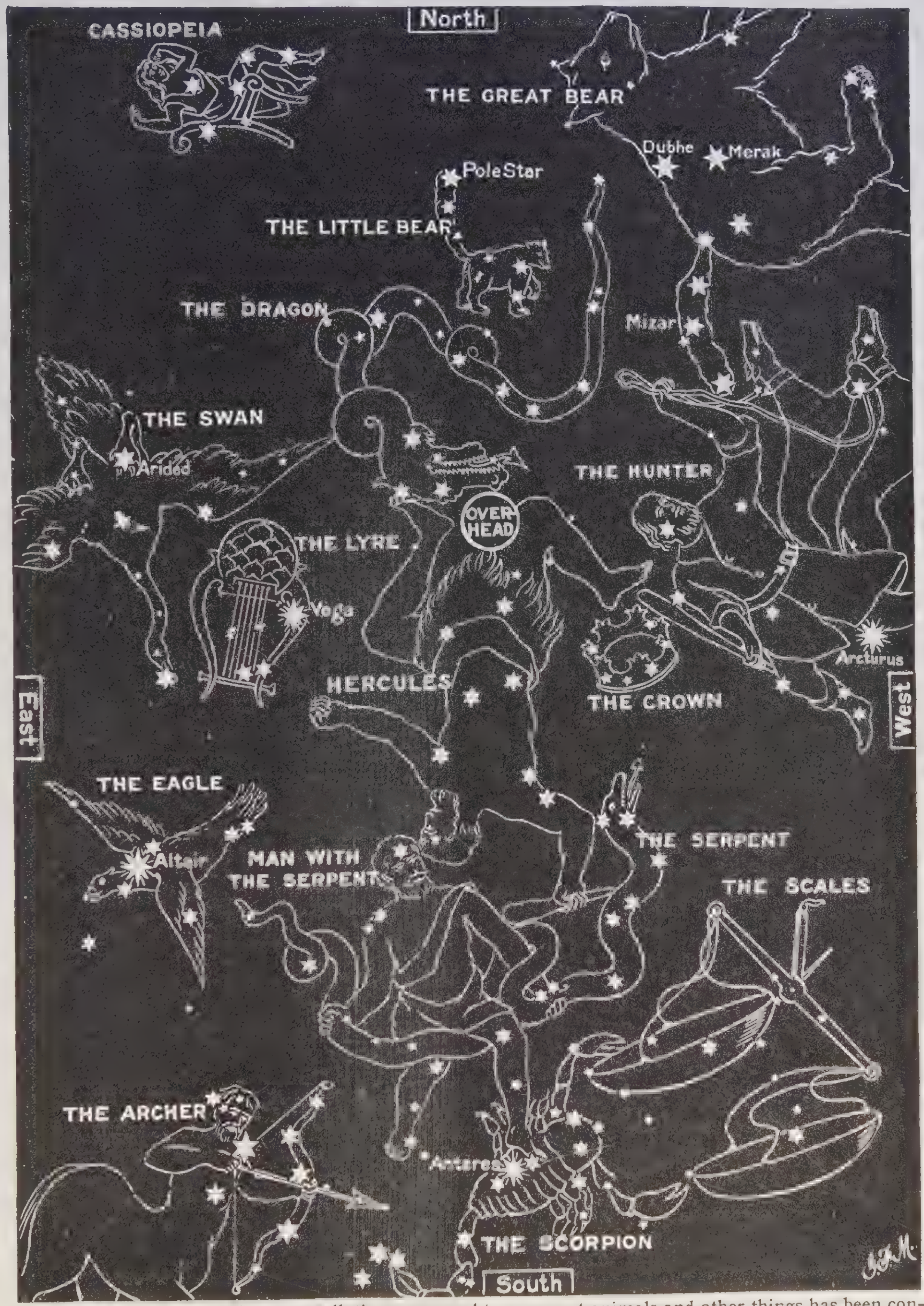
A beautiful white star of the first magnitude is Vega, in the Lyre, lying beside the Milky Way. It is specially interesting, not merely because it is one of the most beautiful stars in the sky, but because careful study shows that it is in the direction of this star that the sun, and we with him, are now moving, at the rate of about twelve miles in every second of time.

Quite near to Cassiopeia is Perseus. This can often be seen as a great L below the great W, and it is interesting because one of its stars is the celebrated double star Algol, which is really two stars, one bright and the other dark. They revolve round one another, so that every few days the dark one partly eclipses the bright one, and so Algol gets brighter and less bright every few days from age to age.

THE FINE SPECTACLE WE CAN SEE IN THE SKY ON A FEBRUARY NIGHT

The map on page 2645 shows the magnificent spectacle that we may see—and should look for—any fine evening in February and thereabouts. Below the L of Perseus, not to the left like Capella, but to the right, and lower than Capella, are the Pleiades. There is nothing in the sky like this wonderful group of stars. It is a true constellation, for the stars which make it are really together. With the unaided eye we can see seven if we are fortunate; with a glass we can see many more. With a telescope and a camera we can print the images of about thirty thousand stars in this mighty group: stars and nebulæ too. In no other part of the sky is there such a tremendous amount of matter gathered together as in the Pleiades. Now run your eye down, and to the left from the Pleiades,

THE MAP OF THE STARS IN SUMMER



The grouping of the stars into constellations supposed to represent animals and other things has been continued by modern astronomers because it has proved convenient, and any change now would cause confusion. One of the names for a group of stars, the Dipper, is a good and useful one, because the seven bright stars that form the tail and back of the Great Bear, as seen in this picture, really have the shape of a dipper, and we can easily find it in the sky. Of course, after giving them names, the ancients built up many fairy tales round the constellations, which professed to tell how the stars came to be there, and some of these stories will be found in other parts of this book. The Great Bear is the most easily seen of all the constellations, and two of its stars point almost in a straight line to the Pole Star, which is always to the north of us.

and you come to the wonderful red star of the first magnitude called Aldebaran. Go on in the same line, and you reach the greatest and most splendid of the constellations, Orion. The map clearly shows how the stars of Orion make the figure of a great huntsman, with three fine stars in his belt, and three smaller ones forming the blade of his dagger. The middle one of these three last is really the most wonderful thing in the sky—it is not a star, but the Great Nebula of Orion, out of which at least six fine stars have already been formed, and doubtless many more will be formed throughout the countless ages to come. Now look downwards and to the left from Orion, and you will see Sirius, the brightest star in the whole sky—"the leader of the heavenly host." We must not suppose, however, that, if we could see all the stars in a line at equal distances from our eyes, Sirius would be the biggest. Sirius, like Algol and thousands of other stars, is really a double star. Its companion is dark, but never gets between Sirius and us, so that the brightness of Sirius does not change.

THE WONDERFUL SIGHT YOU CAN SEE ABOUT BEDTIME

Now we have come down the right side of this map, which really shows us all the greatest glories of the sky, but there are three splendid stars in it still which must be mentioned, and can easily be recognized. These are Castor and Pollux, in the heads of the twins or Gemini, and Procyon in the Little Dog.

If you learn these few stars, and look out for them when there is a chance, they will be easily remembered, and will always make the sky on a fine night vastly more interesting than it would otherwise be. And the fact that you must go to bed early does not matter, for nearly all of them are visible at just about children's bedtime, or not much after.

We might think at first that there was nothing to find out about the brightness of the stars. Anyone with eyes in his head can see that Sirius is brighter than Arcturus, and that Arcturus is brighter than any of the stars in the Pleiades. Also it is not difficult to think of ways of measuring these differences. For instance, we may compare the length of time it takes for various stars to print an image of themselves on a particular kind of photographic plate. If we assume—though we really may not—that the light of all the stars is the same in quality, so far as its affecting a photographic plate is concerned, then we have here a means of measuring the comparative brightness of the stars.

WHY WE CANNOT UNDERSTAND THE REAL BRIGHTNESS OF THE STARS

But, when we come to think of it, we shall see that neither by this method, nor by the simple use of our eyes, nor by any other means of the kind, can we ever learn what is the brightness of the stars. We can learn how bright they appear to us, we can learn the comparative intensity of the light from them when it reaches us; but that is a very different thing. The little moon, shining by reflected sunlight, is vastly brighter than Sirius, which is probably far brighter, really, than a hundred suns. The distance makes this difference, just as it does in the lighthouses in the picture on page 2535.

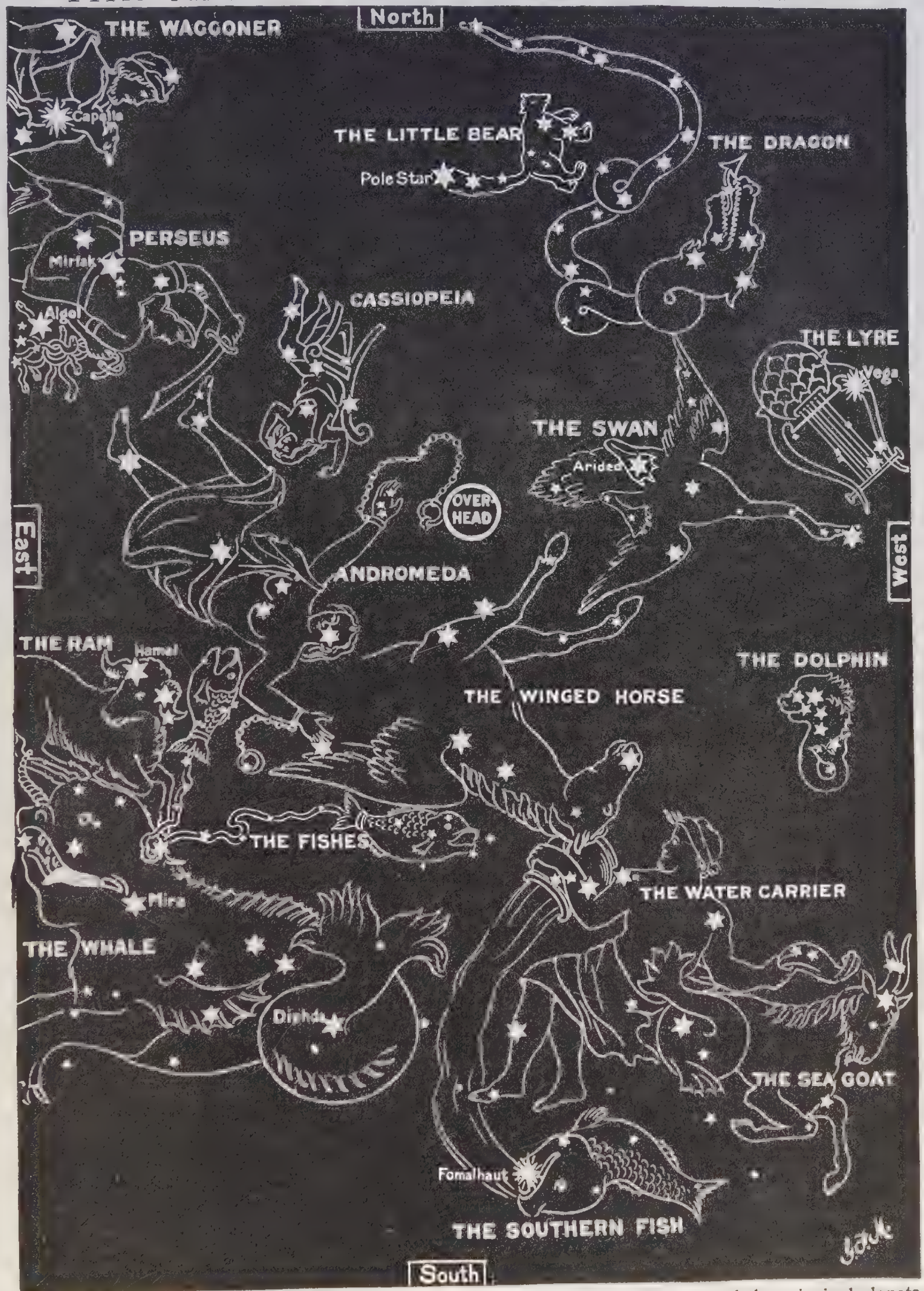
What we can see and learn, then, by these means, is only the *apparent brightness* of the stars. Yet the star that seems to us the brightest in the sky, which is Sirius, might be really the faintest, and might shine brightly only because it happened to be much nearer than any of the others. Therefore, we can only learn anything about the *real* brightness of the stars by taking into account their distance.

Their distance is the first great problem of the stars. All over the world astronomers are working at it, and now we do know the distances, in a very general way, of a fair number of stars. This is how they are found.

HOW MEN FOUND OUT THE DISTANCE OF THE STARS

If a thing is very near your head, and you change the position of your head, the apparent position of the thing changes. Even if you look at it first out of one eye, and then out of the other, its apparent position changes; and if you know the distance between your two eyes, you can in this way measure the distance of the thing at which you look. Now, in the case of a thing like the moon, or a planet, we can change our position of sight by simply noticing where it appears to be when seen first from one part of the earth, and then from another, perhaps hundreds of

THE MAP OF THE STARS IN AUTUMN



We have all heard of the Zodiac, the belt in the heavens within which the sun and the principal planets move. The best-known constellations are those which lie within the Zodiac. They are twelve in number, and some of us have learned a little rhyme to help us to remember their names. It begins like this: "The Ram, the Bull, the Heavenly Twins; and next the Crab, the Lion shines, the Virgin and the Scales." The other groups in the Zodiac are the Scorpion, the Archer, the Goat, the Water Carrier, and the Fishes. We can see all the constellations of the Zodiac in these four star-maps, and can then find them in the sky. These names were given at least 2,500 years ago, and it is said that the Ram and the Archer were the first two constellations to be marked out and named. Many other constellations have been named in more recent times.

miles away. This base-line of a few hundreds of miles is quite enough in such cases, just as the base-line no longer than the distance between your two eyes is enough for a pencil held in front of you. But the stars, even the nearest of them, are so far away that any base-line taken on our little earth is far too short.

What, then, can we do, for we cannot leave the earth? We can use the movement of the earth round the sun. We can look at the star on a certain night, and then look at it again six months later, when the earth is on the other side of the sun. This gives us a base-line about 186,000,000 of miles long—twice the earth's distance from the sun—and that is just long enough to allow us to notice a measurable difference in the apparent position of some stars, and so we can measure their distance. But there are many cases in which we notice *no difference* even when we use this tremendous base-line. Such stars are unimaginable distances away.

HOW MEN CAN TELL THE "WEIGHT" OF STARS THAT ARE OUT OF SIGHT

It is sometimes said that we can weigh the stars, but weight is not the right word to use here. By the weight of a thing, such as this book, we mean simply the amount of pull due to gravitation between it and the earth. If the earth were suddenly to become nothing, the book would lose nearly all its weight, and have left only that due to the pull of the sun. But the amount of stuff in the book would be, of course, the same as before. This amount of stuff we call its *mass*, and it is the mass of the stars that we can measure, or at least try to measure. Their "weight" means nothing, though if we know their mass we can say what their weight or gravitation pull would be at the surface of the earth.

We can measure the mass of a star sometimes when it has another star near it, for we can notice how its movement is affected. For instance, we know an almost endless number of double stars in the heavens—a pair of stars revolving round each other. They move in accordance with their gravitation pull for each other, and that depends on their mass, so that we can measure it. Thus we can even measure the mass of stars we cannot see, which is, I think, a great triumph for astronomy.

The size of the stars is a thing we cannot find out in any direct way, and at best we can only make a guess at it. The reason is that by no possible means at our disposal can we see the disk of a star, so as to measure its diameter—that is, its size across. As no telescope shows this, and as our study of the light from a star tells nothing about its size, it is not easy to see a way in which its size can be measured with certainty.

HOW MEN TRY TO FIND OUT THE SIZE OF THE STARS

But we are not completely baffled, for if we can learn certain other facts about a star, then we can at least *guess* its probable size. If, for instance, we know its distance, if we know its brightness, and, still more, if we know the amount of stuff in it, then we shall not be far from being able to guess what its probable size must be. But these things are very difficult to find, and the results are not very certain or precise; so the most we can say is that probably this star, or that, must be so many times as big as the sun—and that is usually the case—since it gives out so much more light.

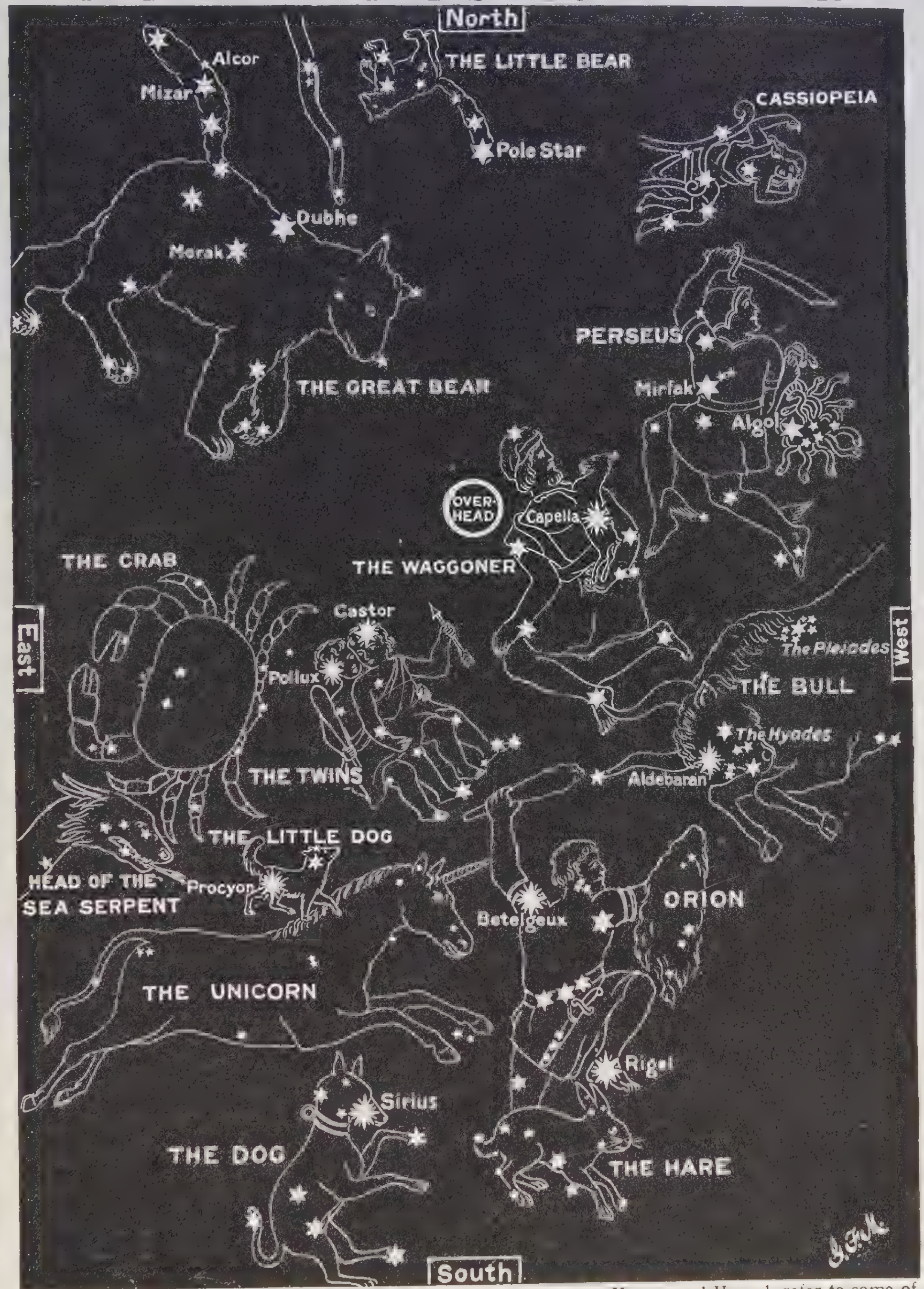
The last point about the stars which we must mention here is their number. To find this, we need more than the eye helped by the largest telescope. We must use a photographic plate, which can see more stars than the eye, simply because the substances in the plate are more readily affected by the light of the stars than are the substances in the screen or retina of the human eye. The number of stars thus to be found is about one hundred millions. This, of course, is a very large number, but it is, after all, not much more than the human population of the United States of America.

HOW MANY STARS ARE THERE IN THE SKY?

Also we do *not* find that, with improved telescopes and cameras, the number of the stars increases, as we should expect it to do if their number were really endless. On the contrary, we have good reason to believe that there is a limit to the number of the visible stars, and therefore, probably, of the dark and invisible stars. Our universe of stars probably has a boundary; but there may be an infinite number of other universes in other parts of space.

THE NEXT PART OF THIS IS ON PAGE 2737.

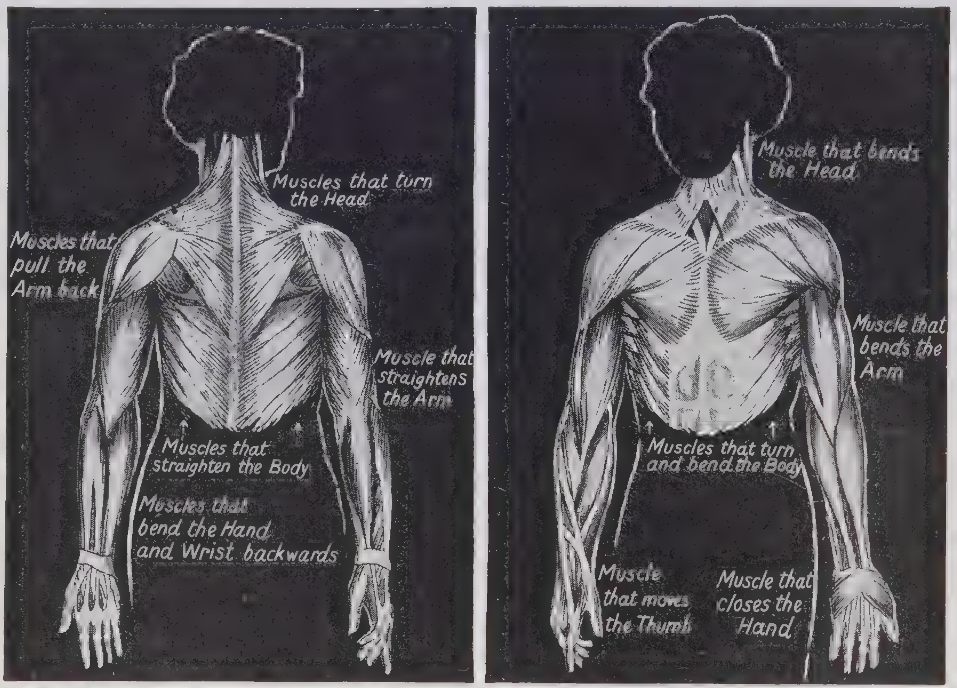
THE MAP OF THE STARS IN WINTER



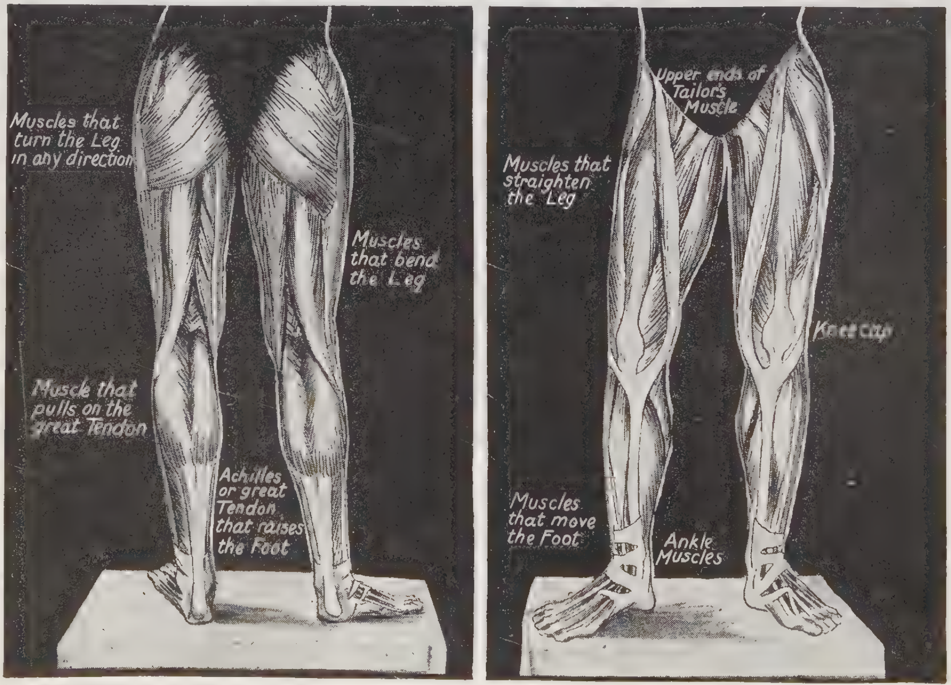
The two earliest Greek writers whose works have come down to us, Homer and Hesiod, refer to some of these constellations by the same names that we give them to-day. They speak of the Bear or the Waggon, part of which is also known to us as the Dipper ; of Orion, whose sparkling belt of three bright stars we all know so well ; of the Dog of Orion, with its starry nose formed by Sirius ; and of the Pleiades. All these constellations are shown in this picture of the sky in winter. The Bible also, in those parts of it which come to us from more ancient times, refers to stars and constellations which have been identified as the Pleiades, Orion, Arcturus, and the twelve signs of the Zodiac. We can read of these by name in Job xxxviii. 31, 32.

The photograph on page 2637 was taken by Dr. Max Wolf, and is reproduced here from " Knowledge."

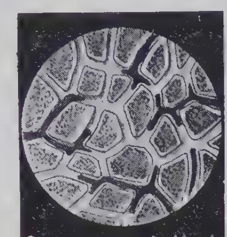
THE MACHINERY THAT MOVES THE BODY


Muscles that turn the Head
Muscles that pull the Arm back
Muscle that straightens the Arm
Muscles that straighten the Body
Muscles that bend the Hand and Wrist backwards
Muscle that bends the Head
Muscle that bends the Arm
Muscles that turn and bend the Body
Muscle that moves the Thumb
Muscle that closes the Hand

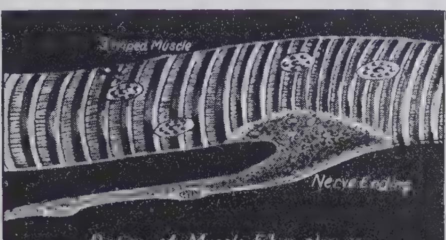
The bones of our bodies are covered with flesh, and this flesh is called muscle. It is the muscles of the body that enable us to move about and do things, and in these pictures, which show both the back and the front of our body, we can see some of the principal muscles, and the parts of the body that they move.


Muscles that turn the Leg in any direction
Muscles that bend the Leg
Muscle that pulls on the great Tendon
Achilles or great Tendon that raises the Foot
Upper ends of Tailor's Muscle
Muscles that straighten the Leg
Knee cap
Muscles that move the Foot
Ankle Muscles

The muscles are not all alike. Some are thin, flat sheets of flesh, others are long and narrow, and others thick, like ropes. They are made up of millions of tiny living cells, that have grown into narrow threads, and are bound together in bundles. The muscles are joined to the bones by tendons, which are bands of gristle.



Cross section of Muscle with Capillaries



Portion of Muscle Fibre showing Nerve Ending

Lengthwise section of Muscle with Vein, Artery, & Capillaries

OUR MUSCLES & THEIR MASTERS

CONTINUED FROM 2574

We have learned about the bones and the skeleton which they make up. We know, too, that the joints between the bones are nearly all made so that the bones can move upon one another. Now, when we come to think of it, we shall see that the only thing we can do in the world is to *move things*; and this we do by moving our own bodies, as I am moving my hand now in writing. So the question is, how the bones are moved at the joints, and if we compare the picture of a man's skeleton with the picture of what the same man would look like if his skin only were taken off, we see at once that the skeleton is clothed, nearly all over, with flesh.

At some parts the fleshy clothing of the bones is lacking; for instance, over the knuckles and one side of the shin-bone, and if we put our hand on these parts we can feel the bone very plainly just under the skin, because there is no flesh there, as on other parts of the body. But if we compare a skeleton only and a skeleton with flesh, side by side, we see that the muscles or flesh make up a very great part of the whole bulk of the body. For example, compare the thigh-bone with the thigh itself, where the bone is completely covered, from end to end, by a great group of muscles, which run down over the knee-joint. We may say that, just as the body includes a bony system, so it includes a muscular system; and we see that, in a sense, the whole body would be useless without the muscles, for *they carry out its orders.* Also the life of the body depends upon *some* of the muscles; for instance, those by which we breathe, and which you, and I, and every one of all the 1,600,000,000 human beings on the earth, are using at this moment.

Now, we must get right ideas of what a muscle is like. Of course, muscles vary in shape, according to the work they have to do. Some are thin and flat sheets of flesh, others are long and narrow, and so on. But the most usual kind of muscle ends in a sort of rope that runs to the bone which the muscle means to pull upon, and is firmly fixed to it. If you look at the front of your own wrist, or if you feel at the back of the knee, whether on the inside or the outside, you will find some of these strong ropes. The proper name for them is *tendons*. Sometimes they are called *sinews*. Long ago they used to be called nerves—which are utterly different things—and so, when a man wrote very strongly and powerfully, they used to say that he wrote " nervous English "—meaning *sinewy* English. Nervous now means something rather the opposite of strong, and so I have explained what the phrase " nervous English " means, in order that we may not have any wrong idea in our minds when we hear it used, or read it in a book. A tendon or sinew at the end of a muscle is quite different from the things which bind the joints together, which are called ligaments, a word which really means binding things.

In the picture on page 2649 we see that a muscle has a body, which is the red flesh, the really living part of the muscle, and at the ends are whitish ropes, the tendons by which the muscle pulls on the bone. The picture shows us the *biceps* muscle of the arm. It is so called because it has two heads or starting-places; these join and form its body, and then comes the great tendon which ends in one of the bones of the forearm.

THE GREAT MUSCLES THAT WORK OUR ARMS, AND HOW THEY GET POWER

When the biceps or any other muscle contracts, or acts, its fleshy part shortens and swells, and so the two ends of the muscle are made to approach each other. Every boy knows how the body of his biceps muscle swells when he bends his elbow; for this is the great lifting-muscle of the arm. Now, when a muscle contracts and moves things, it does work and spends power. We must find where the power comes from, for we are certain that the muscle cannot *create* it.

All muscles are richly supplied with blood. This helps to give them their red color, though most muscles also have in them a red coloring matter which is peculiar to muscles and not found in blood. It is the blood that supplies muscles with the power which they show when they act. The burnable food-stuffs are carried to the muscle, especially sugar, which is the chief muscle food; and in the muscle they are burned by the oxygen which the blood also sends there. This burning has two results, one which is easy to understand, and another which no one understands. The first is that heat is produced. The blood leaving a muscle is thus hotter than the blood entering it. Now we see at once why hard running or jumping makes us hot.

A LIVING MACHINE MADE UP OF MILLIONS OF PARTS

The second result of the burning in the muscle is that, as we have just learned, the muscle shortens; but how it does so, on the instant, and returns, on the instant, no one can guess. Every machine—and a muscle is a living machine—turns some of the energy supplied to it into heat; not all into work. The more work it gives, and the less heat, the better is the machine, for we want work and not heat. Any muscle is better in this respect than most machines made by man; and, further, the heat it *does* make *is* wanted, and properly-fed muscles never wear out.

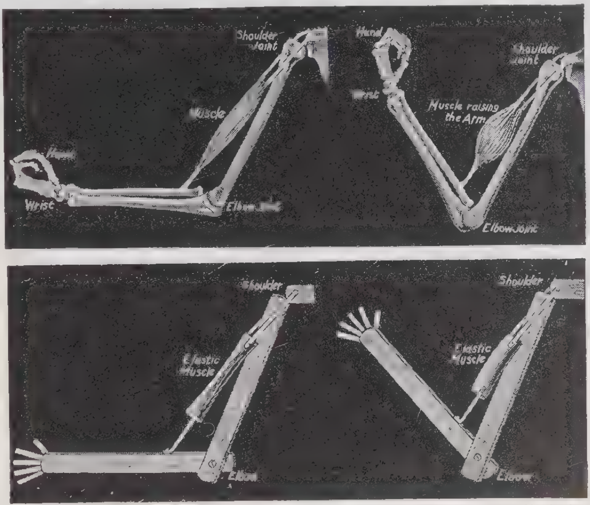
When we examine, not the tendon or rope at the end of a muscle, but its red fleshy part, we find that this consists of millions of living cells, that have grown into the form of narrow fibres or threads, and are bound together in bundles. The mystery of the contraction of a living muscle lies inside the protoplasm of the muscle-cells. We learned about protoplasm in those parts of this book beginning on pages 1121 and 1195. The muscles of the skeleton, such as the biceps, differ from those which cover, for instance, the stomach. The first kind, which is under the influence of the will, shows tiny cross striping when seen under the microscope; the other kind, which acts apart from the will, shows no such striping. So the two kinds of muscles are called voluntary or striped, and involuntary or unstriped. *Voluntas* is Latin for the *will.*

STRENGTH OF LIFE, WHICH IS MORE IMPORTANT THAN STRENGTH OF MUSCLE

We can watch the development of a muscle from muscle-cells, which at first are round and small. When a muscle grows by exercize, certain muscle-cells, which are in it, but have never developed into active muscle-fibres, are made to develop. When they are all used up, the muscle will grow no bigger, however long or well it is exercized. Different people differ widely in the number of cells out of which they can make muscle-fibres by exercize. A man who has never given a thought to the subject may be naturally two or three times as strong as many others who may spend a large part of their lives in doing gymnastics.

The size of the muscular system is of importance in a few cases, as where a man is doing hard physical labor like lifting trunks; but it is of no importance in any other way. It has nothing to do *at all* with strength of life, or *vitality*, as it is called. But people always confuse strength of muscle, or muscularity, with strength of life, or vitality. Women are, in general, much less muscular than men, but they have more vitality. They live longer on the average, and can endure more loss of blood, more exposure, longer starvation, a greater quantity of poison, than men. On every possible ground, strength of life is worth having. Strength of muscle, which has no more to do with strength of life than a man's height has to do with his Christian name, is not of so much importance for human beings, who have conquered the world, and live in it, not by strength, but by skill.

It is quite right that we should desire to have our muscles in good health and fitness, but we must be sure that we clearly understand what muscles are. They are instruments of *our* purposes. In themselves, they are mere lumps of flesh, and, so far from their large size being useful to us, the larger they are the more food they require, and all the greater is the quantity of waste matter they pour into the blood. So it is an expensive matter—expensive in life as well as in money—to keep up a large staff of muscles. The only reason for taking care of the muscles is in order that they shall be able to do their work as instruments of our will and purpose. If they can do that, we should be content. But, unfortunately, there are people who tell us that the great aim of our existence should be physical culture, by which they mean making the muscles as big as we can, and these people wish us to tie ourselves by ropes and pulleys and things to our bedroom doors every morning, and then to lift weights and squeeze springs and pull indiarubber cords, and so on. For a creature who lives by mind and skill, the desire to have enormous muscles is absurd.



We see, in the upper picture, how one of our muscles, called the biceps, lifts the arm by swelling up and drawing the bones together. The muscles are elastic, and can expand and contract. Their action is explained by the lower picture, which shows a rough wooden model of the arm worked by elastic in place of muscles.

If we are to learn how to take proper care of our muscles, we must go back to the workings of the body, and find out what happens when our muscles carry out our orders. Into every muscle of the body we find running at least one round whitish cord, which is called a nerve. One of these nerves, which runs down to give itself to several of the muscles of the forearm, passes behind the elbow for a short distance practically between the skin outside it and the hard bone underneath it. If hit, it makes us uncomfortable, and we call it the "funny-bone." It is no more a bone than it is a comet, but still that is the name we know it by. This nerve is what is called a *mixed* nerve, for it has in it nerve-fibres running to muscles and making them move, and others running from the skin up to the brain for purposes of feeling. These two sorts of nerve-fibres are called motor and sensory. Everyone knows exactly which fingers have their skin supplied from the "funny-bone" nerve, for when it is hit we feel tingling in the little finger, and the side of the ring finger that is next the little finger. The fibres running through the nerve from these fingers have been hit, and make us think we feel something in those fingers. The real name of the "funny-bone" is the ulnar nerve, because it runs along the bone of the forearm called the ulna.

Now we must consider the motor fibres in that and any other nerve that has motor fibres; especially we must see what we mean when we say that every muscle has motor nerve-fibres running into it. Suppose that, by an accident, the motor nerve of a muscle is cut; or suppose that, by taking too much alcohol, or lead, or arsenic, the nerve-fibres have been poisoned and killed, so that they might just as well have been cut across, so far as the muscle is concerned. Two results always happen. The first is that the muscle cannot be used. It is paralysed, and lies still, however eagerly we try to use it. For it is motor nerves that are the motors and the masters of muscles.

MUSCLES THAT ARE THE SERVANTS OF THE NERVES

The second result is in some ways not less interesting. It is that the muscle always begins to waste and grow soft and flabby and small. And we know that the motor nerve is not merely the master of muscle, but a master that takes good care of his servant. Some kind of influence, which we understand no better than we understand any other kind of nerve-current, runs down all motor nerves to the muscles which they supply, and keeps those muscles in health.

Muscles, then, are the servants of nerves; and there is a special way of putting this which is so good that I think we ought to learn it. The word "organ" means instrument. We say that the eye or ear is the *end organ*—the instrument at the end—of the eye-nerve or the ear-nerve, just as the telephone on the desk might be called the end organ of the telephone wire. And now students of this subject have taught us that we ought to look upon muscles as the end organs of motor nerves; just the instruments which carry out their orders. If men and women—those who look after schools, who look after soldiers, or are in any way responsible for the life and guidance of others—knew this truth, that muscles are just the servants of nerves and are to be treated as such, we should soon learn how to make almost all people into the healthiest and most useful kind of human beings.

HOW THE MUSCLES WITHER AWAY IF THEIR MASTERS ARE DESTROYED

If a frog is killed, it is quite easy to separate from its leg the muscle of its calf and the nerve that is its master. If this is kept warm and moistened with water containing a little salt, it will live for quite a long time. Such a thing is called a "nerve-muscle preparation," and you may spend months doing nothing but learning from it. If you pinch the muscle, or put chemicals on it, or if you even apply certain kinds of electricity to it, *little happens*; but if you do these things to the nerve, the muscle contracts so long as nerve and muscle are *alive. The muscle will only obey orders from its master.* Also, we can learn what weariness or fatigue is, and we find that fatigue is scarcely at all a question of muscles, but it is a question of the muscle's master—nerve. And now we must learn where the nerve comes from.

The nerve is a fibre or many fibres, running out from a nerve-cell or nerve-cells. After all, the nerve is only the channel of communication. It starts nothing, any more than the muscle does. The real master is the nerve-cell in the brain or the spinal cord. For every muscle in the body we now know the exact group of nerve-cells, in the lower part of the brain or the spinal cord. If anything destroys them, the muscle is paralysed, and will wither away. Muscle is the servant of nerve-cells, and nerves carry the orders to the muscles.

HOW EDUCATION HELPS TO GIVE US CONTROL OVER OUR MUSCLES

And this leads us to the greatest point of all. What we want, what every creature that has muscles wants, is to do things, to carry out a *purpose.* We care nothing about muscles as such, and we never give an order to any single muscle alone. Why, no animal, no child, very few grown-up people know anything about muscles; but they can do things all the same! In the highest part of the brain, where the willing is done, no muscles are represented, *as such*, by nerve cells. The groups of nerve-cells in the brain represent, not individual muscles, but *groups* of muscles; or, we may say, *purposes*, for each group of muscles stands for a purpose. In every movement that we make, except things like those sudden twitches of the legs that we sometimes get in bed, *many* muscles are involved.

Half the education of a child consists in turning the clumsiness of the baby into the skill of the man or woman; training the muscles, not to get *big*, but to act in groups as the instruments of purposes. That is why some day we shall have more of play and games in teaching children, because Nature knows that they must have many play-purposes when they are young, if they are to carry out well their work-purposes when they are older.

THE NEXT PART OF THIS IS ON PAGE 2727.

WHERE DOES CHALK COME FROM?

CONTINUED FROM 2540

THE chalk seen in cliffs on the south coast of England and the chalk used on a blackboard or for drawing with are the pressed-together remains of the bodies of tiny creatures that once lived in the sea. The rest of their bodies has disappeared ages ago, but the calcium carbonate, which is chalk, has not been altered through all these years. As they died, it fell to the bottom of the sea, and was piled up there, often to very great thicknesses, as we could see for ourselves if we looked at a high chalk cliff.

This went on for many thousands of years, no doubt, but, compared with the deposits of many of the rocks formed at the bottom of the sea, the chalk deposit was quite a quick one. This means, of course, that the cliffs at such a place as Dover were once at the bottom of the sea. If you walk in many parts of England or some parts of France, and find that you have only to scratch the soil to find chalk underneath, or if you pass in a train through a chalk hill, you may reflect that all this was once at the bottom of the sea.

IS THERE GOLD IN THE SEA?

When we come to make a close study of earth or air or sea, we find some minute traces of all sorts of unexpected things in all of them—though it may be only one part in a million. Gold is one of the things we should not expect to find in sea-water, but we do find it in a quite recognizable quantity. If we consider the enormous bulk of the sea, we find that the total quantity of gold in it must be considerable. Yet, fortunately, it is not enough to repay the cost of getting it out, and so no one does so, except chemists, who do it for love of Nature and not for love of gold. I say "fortunately," because we know that the gold is worth very little in itself, *really*, and it is well that a vast quantity of human labour and life is not wasted in extracting it from the sea. If we learn to make gold quite easily—men possibly will learn some day—we shall be still less inclined to seek it in sea-water, which contains things far more precious than gold.

IS THERE RADIUM IN THE SEA?

This wonderful element, radium, which at first was thought to be one of the rarest of all things, is now found to occur everywhere, and to be of the utmost importance wherever it occurs. We find radium in the water of rivers, and we find still more of it in the ocean wherever we look for it. It is clear that the radium, or rather the element *uranium,* from which radium is always being formed, accumulates slowly in the ocean as the rivers bear it there, just as do the salts which the rivers carry. At one time there must have been much less radium than now in the sea, just as there must have been much less salt. Also, we find a considerable quantity of radium in the present deposits at the bottom of the sea, and in past deposits, such as chalk, for example. The total amount of radium in the deposits, or "oozes," at the bottom of all the oceans must be very large, and its consequences, both there and in the sea-water itself, are most important, because, wherever radium is, there it is constantly producing heat. We are just beginning to learn that this presence of radium in the sea and the sea's deposits must have played a part perhaps greater than any other one thing in the history of the changes which the surface of the earth has undergone.

HOW MUCH WATER IS THERE IN THE SEA?

Most of us know that much more than half the whole surface of the earth is covered with water, and if the earth had been of a slightly different size from the size it is, the whole of its surface would be one great ocean. A recent estimate of the extent of the ocean's surface may be trusted as a very careful and precise one. It is rather higher than others we have heard, and now we may take it that *five-sevenths* of the earth's surface is covered with water. If now we could learn the average depth of the sea all over the world, it would only need a big multiplication sum to answer this question.

I will not work the problem here, said the Wise Man, but I think I can tell you the other factor you need. We find great variations in the depth of the oceans—places where the highest mountain might be buried, and great shallow areas, too; but the latest result of an enormous number of soundings taken in every part of the sea, except round the Poles, is that the average depth of the oceans the world over is a little under two and a half miles. This is probably a great deal deeper than you would have thought, and it means a rather long problem if you want to learn the number of *cubic miles* of water on the earth.

WHAT MAKES THE NOTE WHEN THE BOW IS DRAWN ACROSS THE FIDDLE STRINGS?

The note is, as we know, a sound-wave, or a series of to-and-fro vibrations in the air, produced by some vibrating body, which in this case is the violin string. If the string is merely plucked, it only gives a sound that lasts for a moment; in this respect it differs from the string of a piano, which, when struck or plucked, will vibrate for several seconds. We express this difference by saying that the vibrations of a piano string or a harp string are *free,* while those of a violin string are said to be *forced.* When we play with the bow in the ordinary way, the string is forced to vibrate so long as the bow is drawn across it, but directly the bow is withdrawn the string becomes still, and does not continue to vibrate for some time, as in the case of strings that give "free vibrations." If the bow is drawn *very gently* across the string, only part of it vibrates, and so we get a beautiful, thin, soft, and very high note, which is called a *harmonic,* meaning a sound that is in harmony with the note which the whole string makes when it vibrates.

WHAT IS THE DIFFERENCE BETWEEN DISCORD AND HARMONY?

To a certain extent, harmony is a matter of taste and custom. Modern musicians play chords which strike us as quite harmonious, though we know that our ancestors thought them intolerable. But there must always remain a very real difference between harmony and discord, and we find, when we study it, that it is due to the *proportions* between the various notes that are sounded together. A musical note depends upon sound-waves of a certain rate, say, 800 little waves in a second. Now, the notes that are most harmonious with this are those in which the waves bear a very simple proportion, in their number, to 800. A note made by 1,600 vibrations in each second is, indeed, so harmonious that we do not call the two a harmony at all, for the higher note, the one with twice as many vibrations, is simply the octave of the other.

Similarly, a note of 400 vibrations in each second is the octave below. If we take the common chord which everyone knows so well, such as C, E, G, C, on the piano, which everyone finds perfectly harmonious and satisfying, we find a proportion between the vibration numbers of the notes which is correspondingly simple. If the high C were 800, the lower one would be 400, the E 500, and the G 600. In other words, the proportion of the notes in the common chord is simply 4, 5, 6, 8. This simple proportion between the notes is the basis of harmony, and the absence of it is the basis of discord. *Why* our ears should find the one pleasant and the other painful is a question too difficult for us to answer yet.

DOES A BRIDGE SHRINK IN THE SUN?

Certainly not. On the contrary, a bridge expands, or gets larger, in the sun or in the daytime or in the summer, and shrinks, or contracts, in the shade or at night or in winter. The rule is that heat makes everything expand, while cold makes everything shrink. Cold is not a thing, but the absence of heat; and so we may say that everything occupies more or less space according to the amount of heat in it—that is, of course, if other circumstances, such as the pressure round the thing, are kept the same. Metals have a striking way of changing their volume, or size, under the influence of heat, and this change is noticeable in the case of iron or steel bridges such as are built nowadays. If the engineer does not know that bridges expand in the sun, he will build a bridge that is certain soon to warp and strain, and even to crack. He has to reckon on the amount of expansion that will occur under the influence of such heat as the bridge is likely to be exposed to, and he must allow for it. In a bridge like the Brooklyn Bridge, many inches must be allowed for its change of size according to its temperature.

WHY, WITH A MINT WHERE MONEY IS MADE, HAVE WE SUCH A BIG NATIONAL DEBT?

I am afraid we can't hope to pay the National Debt from the Mint, said the Wise Man, for the Mint does not get for nothing the gold and silver and other metals out of which it makes our money. These have to be paid for, like everything else, and that means, of course, that in the long run we pay for them. Nor does it help us at all that the Treasury Department can print paper money and put any figure it likes on it. Bills cost very little to make, but a gold eagle costs its full value. Bills are of no value in themselves, but are valuable because they represent money in existence, and they will not pay the people to whom we owe the National Debt.

No; this debt is one which can only be paid by the work and often the very lives of the people who do work in America to-day. Every year we have to provide the interest, as it is called, on this debt, and sometimes, when the men responsible for the management of the nation's money are wise and careful, we pay off a little of the debt itself. This is the price we have to pay for the wars of past generations, and the same is true for most countries that have a National Debt.

If every generation had to pay for its wars, there would be fewer wars, and the people who try to make them—for it is usually a few people who really make a war—would be laughed at or punished, instead of being called patriots. Patriots of this kind injure a nation while they are alive, and then for generations afterwards millions of people are taxed and made to do without the fruits of their labor, to pay for the wars with which they had nothing to do, and which very often have done them harm. The National Debt of any country is a burden on the people like any other debt.

WHAT MAKES A VOLCANO?

Here is a question which no one has been able to answer. We can examine volcanoes, notice their position, and understand the character of the stuff that comes out of them; but the problem of explaining how volcanoes ever come to be formed is far too difficult for us to answer. But it seems more than probable that before long we shall be able to guess at the truth of this question, because we are just beginning to learn, in a more than vague and general way, how ordinary mountains are formed. And it is radium, this extraordinary element, of whose existence no one knew fifteen years ago, that promises to give us the key to the making of mountains and volcanoes.

We think this because we find radium in all the rocks we examine, however deep we go, just as we find it in sea-water and in chalk; and if this thing, always producing large quantities of heat wherever it is, is found in all the rocks of the earth's surface, we begin to see how things like mountains, including volcanoes, may have been formed.

DOES RAIN MELT THE ROCKS?

There are two things in rain, besides the water itself, that have a great power of melting things; and even the very hardest rocks, such as granite, which look as if no amount of rain could affect them, are melted down by it in time. These two things are oxygen and carbon dioxide. Alone they have no effect on the rocks, but dissolved in water they form important agents in what is called weathering. Carbon dioxide dissolved in water will attack limestone, melting it, so that it may be carried down stream into rivers, finally to reach the sea.

Carbon dioxide, acting with heat and cold, and in union with other substances, will even melt portions of hard rocks, such as granite, setting free the glassy part, which becomes sand first, and finally turns into sandstone. This process goes on very slowly, but it goes on very certainly; and in both of these respects it is like the greater number of Nature's most important processes. The two acids in rain are still more important in their relation to life; the carbonic acid, as we already know, and the nitric acid are part of the food upon which the plant lives.

WHY CAN WE SEE THROUGH GLASS BUT NOT THROUGH THE THINGS IT IS MADE OF?

Well, glass need not be transparent, as we all know, for it may be made in such a way as to form what we call ground glass, and be only *translucent*—letting light through, but scattering it so that the objects from which it comes are not visible.

But even so it is very different from the quite opaque things, such as sand, from which it is made. The answer to the question is that the *transparency* or *opacity* of a thing depends on the way in which its molecules are arranged. Many other substances, besides glass, can be made, when they are melted, to change into what is called a *vitreous*—which is Latin for *glassy*—form; and in this the molecules lie beside one another in such a regular way that they allow light to pass through them. All glass cuts off some light—you will notice that spectacle lenses throw a light-grey shadow on a piece of white paper—and glass has not exactly the same degree of transparency for different rays of light; but such transparency as it has, depends on the arrangement of its molecules.

Glass does not burn when it is heated, nor does the sand of which it is made. The reason is that, being fully burned, or oxidized, already, it cannot burn again.

WHY DO WE SOMETIMES GET A "STITCH" IN THE SIDE WHEN WE RUN?

When we run we require a quick renewal of the oxygen in our blood, as we are using it up very quickly in our muscles. Therefore we have to breathe quickly and deeply, and this we do especially by means of the great breathing muscle called the diaphragm, about which we read on page 1651. This muscle, though strong and broad, is rather delicate at certain points. It is attached to the inner surfaces of each of the six lower ribs, on each side of the body, by rather fine slips of fibre. These same ribs are also moved by muscles that lie between each two of them; and the explanation of a "stitch" probably is that, as the ribs move rapidly and rather forcibly when we breathe quickly and deeply, sometimes one of the attachments of the diaphragm gets a little strained, and that causes the pain we feel.

We think of a stitch as a bad thing, but it is really good for it is the warning that prevents us from doing serious harm to the slightly strained fibres. They get a rest, and probably when we start again we so arrange as not to throw quite so much work upon them. The practised runner does not get a stitch because, by practice, he has learned to use all his breathing muscles, though unusually hard, yet in a nicely balanced way, so that no part of them is strained.

WHAT MAKES US DIE?

The great cause of death among human beings is disease, and this is a fact never to be forgotten, because it offers such a great contrast to the animal world. With our intelligence, and our laws and our habits of life, we have very nearly abolished death by starvation and by murder. Therefore, except for accident, we should die of old age, were it not that we are exceedingly liable to disease, which is quite a small and unimportant matter in the lives of practically all creatures but ourselves.

We are now learning that we bring diseases upon ourselves by doing unnatural things, which animals and plants do not do. We eat when we are not hungry, and cheat our appetites with dainties, and so wear out the organs that have to deal with food. We take huge quantities of alcohol, which no animal ever touches. We live in foul air, shut up from light and freshness, while our dogs and cattle live in the air and sunshine. We create and breathe smoke, we neglect our sleep, and do a hundred other stupid things. The penalty for this is disease, and the most important lesson to be learned from the study of life is that disease is almost a peculiarity of *man*, that he brings it upon himself, and that it will be abolished when man learns a little of the wisdom which any animal, by its mode of conducting its life, teaches him, unless, indeed, it be a domestic animal which has caught some of our own bad habits.

WHY IS IT THAT WE DIE?

Yet when men have learned how to avoid disease, and when death from old age is as common as it is rare to-day, even then the great fact of death will remain; though it will be a very different thing from death to-day—the most terrible feature of which is that it almost always comes too soon—yet we shall still have the same problem to solve which has troubled people in all ages. Perhaps we can begin to discern some kind of an answer if we look, not at the life of man alone, but at all the life of the earth.

Then it will seem as if death were the necessary condition of *more life*; it will be seen that all death is yet the beginning of further life upon the earth, that nothing is really wasted or lost; and even that, if it were not for death and birth, life could never have evolved from its lowly beginnings in the humblest animals and plants to what it is already. And even in our own lives we may see that there are great compensations for death—if we could see far enough, we might even see that death makes life worth living. The best things in life are parenthood and children and childhood. If there were no death, then there could be no birth, for there would be no room for children, and a world without a child would not be worth living in.

The question of food supply is practically the first question for all living things. Air is equally necessary, but it can always be had everywhere; food is not so plentiful. The commonest cause of death among the lower creatures, both animals and plants, is starvation. This especially affects the young offspring of these creatures, and the greater number of their young die from want of food.

WHAT MAKES THE LOWER CREATURES DIE?

Next to death by starvation among lower creatures is death by murder, if we may call it by so ugly a name. This does not apply very much to the vegetable world, as plants do not live upon each other to any great extent; but enormous numbers of young plants die because they are eaten by animals, and a small number of animals die because their bodies are invaded by tiny plants that live upon them. In the animal world, killing and being killed for food goes on without ceasing.

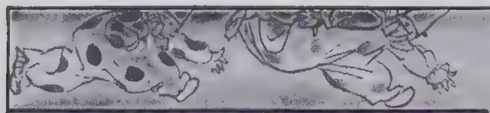
We must not think of this as a very cruel process, involving terrible pain, for that is not so. Animals cannot suffer pain to the same extent as we do, and their death is usually swift and merciful. A single human being, in the course of his life and death, usually suffers far more pain and distress than many animals put together. What we call disease, a far more painful and cruel thing than being instantly killed, accounts for comparatively few deaths among the lower creatures.

WHY DO LOBSTERS TURN RED IN BOILING?

The red color of a boiled lobster is simply due to a chemical change that occurs in the brown coloring matter of the shell when it is heated. It is curious that red coloring matter, such as the hæmoglobin of our blood, turns brown when it is heated, but the brown of a lobster's shell turns red. If the lobster were red in the sea he would be too easily seen, and would not be able to catch his food unawares, so he would die of starvation.

The question reminds me of the celebrated definition of a crab or a lobster as a "red fish that walks backwards." This, you know, is a perfectly correct definition, except that a lobster is not red, it is not a fish—but a much humbler kind of animal—and it does not walk backwards!

THE NEXT QUESTIONS ARE ON PAGE 2733.



WHEN I'M GROWN UP

I THINK, when I'm a grown-up man,
I'd like to be
A bus conductor if I can,
Or, let me see—
It would be very, very nice
To keep a shop,
Where I could eat vanilla ice
And never stop.

I'd like to be a soldier, too,
It must be fun
To lie down flat, as soldiers do,
And fire a gun.

And then I'd love to flour my face
And be a clown,
Like two we saw, who ran a race,
And both fell down.

But when I'm tired, it seems to me,
What I enjoy
The best of all is just to be
My mammy's boy.

WHEN MUMMY'S AWAY

I WASN'T brave, I *had* to cry
The other day
When darling mummy said good-bye,
And went away.

The time seemed very, very long
Alone with nurse;
And everything I did went wrong,
Which made it worse.

For, as I ran across the hall
With Sybil Grace,
My fav'rite doll, I let her fall
And cracked her face.

And then I tumbled on some stones
And cut my knee;
Nurse tied it up, and gave me scones
With jam for tea.

Though she is kind, and mended Grace,
How could she tell
I wanted *mum* to kiss the place
And make it well?

But now my troubles seem to go,
And all is bright,
For mummy's coming home, I know
To-morrow night!

JOHN GILPIN

WILLIAM COWPER, in this celebrated ballad, has made fun, in his own quiet way, of a very worthy old linen-draper who used to have a shop in Paternoster Row, London, where he died in 1791 at the age of ninety-eight. The story was told to the poet by a lady friend in order to entertain him, as he was inclined to melancholy, and, thanks to his genius, it has served to amuse multitudes of readers, and will ever remain a favorite with the countrymen of the poet and the linen-draper. The charming illustrations which we give with the poem are from the well-known drawings of the late Randolph Caldecott, a famous humorous artist.

CONTINUED FROM 2514

JOHN GILPIN was a citizen
Of credit and renown,
A train-band captain eke was he
Of famous London town.

John Gilpin's spouse said to her dear,
"Though wedded we have been
These twice ten tedious years, yet we
No holiday have seen.

"To-morrow is our wedding day,
And we will then repair
Unto the Bell at Edmonton
All in a chaise and pair.

"My sister and my sister's child.
Myself, and children three,
Will fill the chaise; so you must ride
On horseback after we."

He soon replied, "I do admire
Of womankind but one,
And you are she, my dearest dear,
Therefore it shall be done.

"I am a linen-draper bold,
As all the world doth know;
And my good friend, the Calender,
Will lend his horse to go."

Quoth Mrs. Gilpin, "That's well said;
And for that wine is dear,
We will be furnish'd with our own,
Which is both bright and clear."

John Gilpin kiss'd his loving wife;
O'erjoy'd was he to find
That, though on pleasure she was bent,
She had a frugal mind.

The morning came, the chaise was brought,
But yet was not allowed
To drive up to the door, lest all
Should say that she was proud.

So three doors off the chaise was stay'd,
Where they did all get in,
Six precious souls, and all agog
To dash through thick and thin.

Smack went the whip, round went the wheels,
Were never folk so glad;
The stones did rattle underneath,
As if Cheapside were mad.

John Gilpin, at his horse's side,
Seiz'd fast the flowing mane,
And up he got, in haste to ride,
But soon came down again.

For saddle-tree scarce reach'd had he,
His journey to begin,
When, turning round his head, he saw
Three customers come in.

So down he came; for loss of time,
Although it grieved him sore,
Yet loss of pence, full well he knew,
Would trouble him much more.

'Twas long before the customers
  Were suited to their mind,
When Betty, screaming, came downstairs,
  " The wine is left behind ! "

" Good lack ! " quoth he, " yet bring it me,
  My leathern belt likewise,
In which I bear my trusty sword
  When I do exercise."

Now Mistress Gilpin (careful soul !)
  Had two stone bottles found,
To hold the liquor that she loved,
  And keep it safe and sound.

Each bottle had a curling ear,
  Through which the belt he drew
And hung a bottle on each side,
  To make his balance true.

Then over all, that he might be
  Equipp'd from top to toe,
His long red cloak, well brush'd and neat,
  He manfully did throw.

Now see him mounted once again
  Upon his nimble steed,
Full slowly pacing o'er the stones,
  With caution and good heed.

But finding soon a smoother road
  Beneath his well-shod feet,
The snorting beast began to trot,
  Which gall'd him in his seat.

So, " Fair and softly," John he cried,
  But John he cried in vain ;
That trot became a gallop soon,
  In spite of curb and rein.

So stooping down, as needs he must
  Who cannot sit upright,
He grasp'd the mane with both his hands,
  And eke, with all his might.

His horse, who never in that sort
  Had handled been before,
What thing upon his back had got
  Did wonder more and more.

Away went Gilpin, neck or nought ;
  Away went hat and wig ;
He little dreamt, when he set out,
  Of running such a rig.

The wind did blow, the cloak did fly,
  Like streamer long and gay,
Till loop and button failing both,
  At last it flew away.

Then might all people well discern
  The bottles he had slung ;
A bottle swinging at each side,
  As hath been said or sung.

The dogs did bark, the children scream'd,
  Up flew the windows all ;
And every soul cried out, " Well done ! '
  As loud as he could bawl.

Away went Gilpin—who but he ?
  His fame soon spread around,
" He carries weight ! he rides a race !
  'Tis for a thousand pound ! "

And still as fast as he drew near,
  'Twas wonderful to view
How in a trice the turnpike men
  Their gates wide open threw.

And now, as he went bowing down
  His reeking head full low,
The bottles twain behind his back
  Were shatter'd at a blow.

Down ran the wine into the road
  Most piteous to be seen,
Which made his horse's flanks to smoke
  As they had basted been.

But still he seem'd to carry weight,
With leathern girdle braced ;
For all might see the bottle necks
Still dangling at his waist.

Thus all through merry Islington
These gambols he did play,
Until he came unto the Wash
Of Edmonton so gay ;

And there he threw the wash about
On both sides of the way,
Just like unto a trundling mop,
Or a wild goose at play.

At Edmonton his loving wife
From the balcony spied
Her tender husband, wondering much
To see how he did ride.

" Stop, stop, John Gilpin, here's the house ! "
They all aloud did cry ;
" The dinner waits, and we are tired."
Said Gilpin, " So am I ! "

" What news ? What news ? Your tidings tell ;
Tell me you must and shall—
Say, why bare-headed you are come,
Or why you come at all ? "

Now Gilpin had a pleasant wit,
And loved a timely joke ;
And thus, unto the Calender,
In merry guise he spoke :

" I came because your horse would come ;
And, if I well forebode,
My hat and wig will soon be here,
They are upon the road."

The Calender, right glad to find
His friend in merry pin,
Return'd him not a single word,
But to the house went in.

Whence straight he came, with hat and wig,
A wig that flowed behind ;
A hat not much the worse for wear,
Each comely in its kind.

JOHN GILPIN ON HIS WILD CAREER THROUGH MERRY ISLINGTON

The dogs did bark, the children scream'd, up flew the windows all ;
And every soul cried out, " Well done ! " as loud as he could bawl.

But yet his horse was not a whit
Inclin'd to tarry there ;
For why ? his owner had a house
Full ten miles off, at Ware.

So like an arrow swift he flew,
Shot by an archer strong ;
So did he fly—which brings me to
The middle of my song.

Away went Gilpin, out of breath,
And sore against his will,
Till, at his friend the Calender's,
His horse at last stood still.

The Calender, amazed to see
His neighbour in such trim,
Laid down his pipe, flew to the gate,
And thus accosted him.

He held them up, and in his turn
Thus show'd his ready wit :
" My head is twice as big as yours,
They therefore needs must fit.

" But let me scrape the dust away,
That hangs upon your face ;
And stop and eat, for well you may
Be in a hungry case."

Said John, " It is my wedding day,
And all the world would stare,
If wife should dine at Edmonton,
And I should dine at Ware."

So, turning to his horse, he said :
" I am in haste to dine ;
'Twas for your pleasure you came here
You shall go back for mine."

JOHN GILPIN CANNOT STOP AT THE INN

At Edmonton his loving wife from the balcony spied
Her tender husband, wondering much to see how he did ride.
"Stop, stop, John Gilpin, here's the house!" they all aloud did cry;
"The dinner waits, and we are tired." Said Gilpin, "So am I!"

Ah, luckless speech, and bootless boast!
  For which he paid full dear;
For, while he spake, a braying ass
  Did sing most loud and clear;

Whereat his horse did snort, as he
  Had heard a lion roar,
And gallop'd off with all his might,
  As he had done before.

Away went Gilpin, and away
  Went Gilpin's hat and wig;
He lost them sooner than at first,
  For why?—they were too big.

Now Mrs. Gilpin, when she saw
  Her husband posting down
Into the country far away,
  She pull'd out half-a-crown.

And thus unto the youth she said,
  That drove them to the Bell,
"This shall be yours, when you bring back
  My husband safe and well."

The youth did ride, and soon did meet
  John coming back amain;
Whom in a trice he tried to stop,
  By catching at his rein;

But not performing what he meant,
  And gladly would have done,
The frighted steed he frighted more,
  And made him faster run.

Away went Gilpin, and away
  Went postboy at his heels,
The postboy's horse right glad to miss
  The rumbling of the wheels.

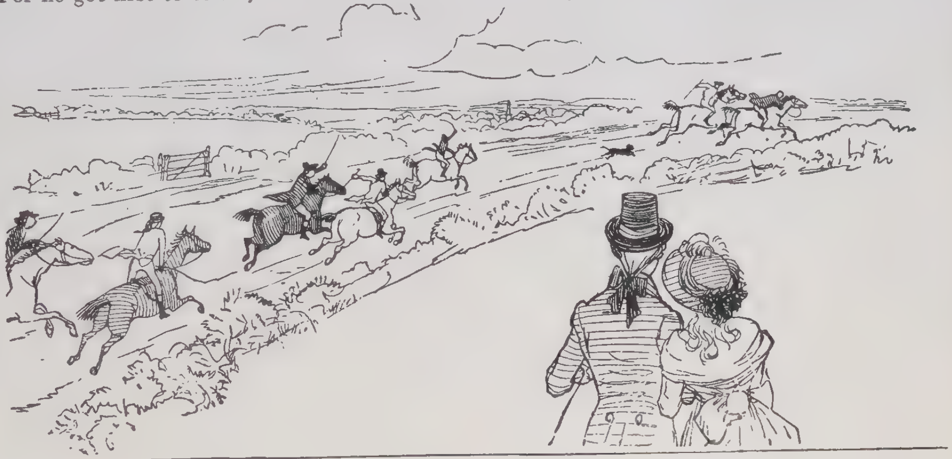
Six gentlemen upon the road
  Thus seeing Gilpin fly,
With postboy scampering in the rear,
  They rais'd a hue and cry:

"Stop thief! Stop thief! A highwayman!"
  Not one of them was mute;
And all and each that passed that way
  Did join in the pursuit.

And now the turnpike gates again
  Flew open in short space:
The toll-men thinking, as before,
  That Gilpin rode a race.

And so he did, and won it too,
  For he got first to town;
Nor stopp'd till where he had got up
  He did again get down.

Now let us sing, long live the king,
  And Gilpin, long live he;
And, when he next doth ride abroad,
  May I be there to see.



KING LEAR AND HIS THREE DAUGHTERS

In the STORY OF FAMOUS BOOKS we can read elsewhere the story of "King Lear," as Shakespeare treats it in the famous tragedy of that name. It was there stated that Shakespeare's great tragedy was founded upon an old English legend, and here is the legend, as told in an old ballad, the author of which is, of course, unknown. In the ballad the king's name is spelt Leir, but here we have given it the same spelling as it has in Shakespeare's play.

King Lear once ruled in this land
  With princely power and peace;
And had all things with heart's content,
  That might his joys increase.
Amongst those things that Nature gave,
  Three daughters fair had he,
So princely seeming, beautiful,
  As fairer could not be.

So on a time it pleased the king
  A question thus to move,
Which of his daughters to his Grace
  Could shew the dearest love;
"For to my age you bring content,"
  Quoth he, "then let me hear,
Which of you three in plighted troth
  The kindest will appear."

To whom the eldest thus began:
  "Dear father, mine," quoth she,
"Before your face to do you good,
  My blood shall rendered be;
And for your sake my bleeding heart
  Shall here be cut in twain,
Ere that I see your reverend age
  The smallest grief sustain."

"And so will I," the second said,
  "Dear father, for your sake,
The worst of all extremities
  I'll gently undertake;
And serve your Highness night and day
  With diligence and love,
That sweet and quietness
  Discomforts may remove."

"In doing so, you glad my soul,"
  The aged king replied;
"But what sayest thou, my youngest girl,
  How is thy love allayed?"
"My love" (quoth young Cordelia then)
  "Which to your Grace I owe,
Shall be the duty of a child,
  And that is all I'll show."

"And wilt thou show no more," quoth he,
  "Than doth thy duty bind?
I well perceive thy love is small
  When as no more I find.
Henceforth I banish thee my court,
  Thou art no child of mine;
Nor any part of this my realm
  By favour shall be thine.

"Thy elder sisters' loves are more
Than I can well demand,
To whom I equally bestow
My kingdom and my land,
My pompal state and all my goods,
That lovingly I may
With those thy sisters be maintained
Until my dying day."

Thus flattering speeches won renown
By these two sisters here;
The third had causeless banishment,
Yet was her love more dear;
For poor Cordelia patiently
Went wandering up and down,
Unhelped, unpitied, gentle maid,
Through many an English town.

Until at last in famous France
She gentler fortunes found;
Though poor and bare, yet she was deemed
The fairest on the ground;
Where, when the king her virtues heard,
And this fair lady seen,
With full consent of all his court,
He made his wife and queen.

Her father King Lear this while
With his two daughters stayed:
Forgetful of their promised loves,
Full soon the same decayed;
And living in Queen Regan's court,
The eldest of the twain,
She took from him his chiefest means,
And most of all his train.

For whereas twenty men were wont
To wait with bended knee,
She gave allowance but to ten,
And after scarce to three;
Nay, one she thought too much for him;
So took she all away,
In hope that in her court, good king,
He would no longer stay.

"Am I rewarded thus," quoth he,
"In giving all I have
Unto my children, and to beg
For what I lately gave?
I'll go unto my Goneril:
My second child, I know,
Will be more kind and pitiful,
And will relieve my woe."

Full fast he hies then to her court;
Where, when she heard his moan,
Returned him answer, that she grieved
That all his means were gone.
But no way could relieve his wants;
Yet, if that he would stay
Within her kitchen, he should have
What scullions gave away.

When he had heard with bitter tears.
He made his answer then;
"In what I did, let me be made
Example to all men.
I will return again," quoth he,
"Unto my Regan's court;
She will not use me thus, I hope,
But in a kinder sort."

Where, when he came, she gave command
To drive him thence away;
When he was well within her court
(She said) he would not stay.

Then back to Goneril,
The woeful king did hie,
That in her kitchen he might have
What scullion boys set by.

But there of that he was denied,
Which she had promised late:
For once refusing, he should not
Come after to her gate.
Thus 'twixt his daughters, for relief
He wandered up and down;
Being glad to feed on beggar's food,
That lately wore a crown.

And calling to remembrance then
His youngest daughter's words,
That said the duty of a child
Was all that love affords;
But doubting to repair to her,
Whom he had banished so,
Grew frantic mad; for in his mind
He bore the wounds of woe:

Which made him rend his milk-white locks
And tresses from his head,
And all with blood bestain his cheeks,
With age and honour spread.
To hills and woods and watery founts
He made his hourly moan,
Till hills and woods and senseless things
Did seem to sigh and groan.

Even thus possessed with discontents,
He passéd o'er to France,
In hopes from fair Cordelia there,
To find some gentler chance;
Most virtuous dame! which when she heard
Of this her father's grief,
As duty bound, she quickly sent
Him comfort and relief.

And by a train of noble peers,
In brave and gallant sort,
She gave in charge he should be brought
To Aganippus' court;
Whose royal king, with noble mind,
So freely gave consent,
To muster up his knights at arms,
To fame and courage bent.

And so to England came with speed,
To repossess King Lear,
And drive his daughters from their thrones
By his Cordelia dear.
Where she, true-hearted, noble queen,
Was in the battle slain:
Yet he, good king, in his old days,
Possessed his crown again.

But when he heard Cordelia's death,
Who died indeed fór love
Of her dear father, in whose cause
She did this battle move:
He swooning fell upon her breast,
From whence he never parted;
But on her bosom left his life,
That was so truly hearted.

The lords and nobles when they saw
The end of these events,
The other sisters unto death
They doomèd by consents;
And being dead, their crowns they left
Unto the next of kin;
Thus have you seen the fall of pride,
And disobedient sin.

ON FIRST LOOKING INTO CHAPMAN'S HOMER

MUCH have I travell'd in the realms of gold
And many goodly states and kingdoms seen,
Round many western islands have I been,
Which bards in fealty to Apollo hold.

Oft of one wide expanse had I been told
That deep-brow'd Homer ruled as his demesne:
Yet did I never breathe its pure serene
Till I heard Chapman speak out loud and bold:
—Then felt I like some watcher of the skies
When a new planet swims into his ken;
Or like stout Cortez—when with eagle eyes
He stared at the Pacific, and all his men
Look'd at each other with a wild surmise—
Silent, upon a peak in Darien.

—JOHN KEATS.

LINCOLN, THE MAN OF THE PEOPLE *

WHEN the Norn Mother saw the Whirlwind Hour
Greatening and darkening as it hurried on,
She left the Heaven of Heroes and came down
To make a man to meet the mortal need.
She took the tried clay of the common road—
Clay warm yet with the genial heat of Earth,
Dashed through it all a strain of prophecy;
Tempered the heap with thrill of human tears;
Then mixed a laughter with the serious stuff.
Into the shape she breathed a flame to light
That tender, tragic, ever-changing face.
Here was a man to hold against the world,
A man to match the mountains and the sea.

The colour of the ground was in him, the red earth;
The smack and tang of elemental things:
The rectitude and patience of the cliff;
The good will of the rain that loves all leaves;
The friendly welcome of the wayside well;
The courage of the bird that dares the sea;
The gladness of the wind that shakes the corn;
The pity of the snow that hides all scars;
The secrecy of streams that make their way
Beneath the mountain to the rifted rock;
Tolerance and equity of light
That gives as freely to the shrinking flower
As to the great oak flaring to the wind—
To the grave's low hill as to the Matterhorn
That shoulders out the sky.

Sprung from the West,
The strength of virgin forests braced his mind,
The hush of spacious prairies stilled his soul.
Up from log cabin to the Capitol,
One fire was on his spirit, one resolve—
To send the keen axe to the root of wrong,
Clearing a free way for the feet of God.
And evermore he burned to do his deed
With the fine stroke and gesture of a king:
He built the rail-pile as he built the State,
Pouring his splendid strength through every blow,
The conscience of him testing every stroke,
To make his deed the measure of a man.
So came the Captain with the mighty heart;
And when the judgment thunders split the house,
Wrenching the rafters from their ancient rest,
He held the ridgepole up, and spiked again
The rafters of the Home. He held his place—
Held the long purpose like a growing tree—
Held on through blame and faltered not at praise,
And when he fell in whirlwind, he went down
As when a lordly cedar, green with boughs,
Goes down with a great shout upon the hills,
And leaves a lonesome place against the sky.

HAIL, COLUMBIA

This national song, written in 1798, was composed to inspire patriotism. The author, Joseph Hopkinson, was the son of one of the signers of the Declaration of Independence.

HAIL, Columbia! happy land!
Hail, ye heroes! heaven-born band!
Who fought and bled in Freedom's cause,
Who fought and bled in Freedom's cause,
And when the storm of war was gone,
Enjoyed the peace your valour won;
Let independence be your boast,
Ever mindful what it cost,
Ever grateful for the prize,
Let its altar reach the skies.

CHORUS.

Firm united let us be,
Rallying round our liberty,
As a band of brothers joined,
Peace and safety we shall find.

Immortal patriots, rise once more,
Defend your rights, defend your shore;
Let no rude foe with impious hand,
Let no rude foe with impious hand,
Invade the shrine where sacred lies
Of toil and blood the well-earned prize;
While offering peace, sincere and just,
In Heaven we place a manly trust
That truth and justice may prevail,
And every scheme of bondage fail.—*Cho.*

Behold the chief who now commands,
Once more to serve his country stands!
The rock on which the storm was beat!
The rock on which the storm was beat!
But armed in virtue, firm and true,
His hopes are fixed on heaven and you.
When hope was sinking in dismay,
When gloom obscured Columbia's day,
His steady mind, from changes free,
Resolves on death or liberty.—*Cho.*

MOTHER'S WORLD

This pretty little poem of a mother's love for her children was written by Margaret H. Alden, a Canadian poet.

EYES of blue and hair of gold,
Cheeks all brown with summer tan,
Lips that much of laughter hold,
That is mother's little Man.

Shining curls like chestnut brown,
Long-lashed eyes demure and staid,
Sweetest face in all the town,
That is mother's little Maid.

Dainty room with snow-white beds,
Where, like flowers with petals curled,
Rest in peace two dreaming heads,
That—is mother's little world!

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THE TIDE RIVER

The changing nature of a great river that rises "clear and cool" among the hills and flows, ever increasing, through lovely scenes and ugly scenes, by fresh meadows and murky towns, and at length falls into the mighty ocean, is described with power and truth in this poem by Charles Kingsley.

CLEAR and cool, clear and cool,
By laughing shallow and dreaming pool;
Cool and clear, cool and clear,
By shining shingle and foaming wear.
Under the crag where the ouzel sings,
And the ivied wall where the church-bell rings,
Undefiled, for the undefiled.
Play by me, bathe in me, mother and child.
Dank and foul, dank and foul,
By the smoky town in its murky cowl.
Foul and dank, foul and dank,
By wharf, and sewer, and slimy bank.
Darker and darker the farther I go,
Baser and baser the richer I grow.
Who dare sport with the sin-defiled?
Shrink from me, turn from me, mother and child.
Strong and free, strong and free,
The floodgates are open, away to the sea.
Free and strong, free and strong,
Cleansing my streams as I hurry along
To the golden sands and the leaping bar,
And the taintless tide that awaits me afar,
As I lose myself in the infinite main,
Like a soul that has sinned and is pardoned again.
Undefiled for the undefiled,
Play by me, bathe in me, mother and child.

UNDER MY WINDOW

"Under My Window" is a quaint little poem which you will discover to be fairly rippling over with childish mischief and fun and frolic. It was written by Thomas Westwood.

UNDER my window, under my window,
All in the midsummer weather,
Three little girls, with fluttering curls,
Flit to and fro together:—
There's Bell with her bonnet of satin sheen,
And Maud with her mantle of silver-green,
And Kate with her scarlet feather.

Under my window, under my window,
Leaning stealthily over,
Merry and clear, the voice I hear
Of each glad-hearted rover.
Ah! sly little Kate, she steals my roses,
And Maud and Bell twine wreaths and posies,
As merry as bees in clover.

Under my window, under my window,
In the blue midsummer weather,
Stealing slow, on a hushed tiptoe,
I catch them all together:—
Bell with her bonnet of satin sheen,
And Maud with her mantle of silver-green,
And Kate with the scarlet feather.

Under my window, under my window,
And off through the orchard closes;
While Maud she flouts, and Bell she pouts,
They scamper, and drop their posies;
But dear little Kate takes nought amiss,
And leaps in my arms with a loving kiss,
And I give her all my roses.

MY MOTHER'S HANDS *

Mothers, mothers, how much they do for us! How little we comprehend the enfolding wonder of their love! "There are no old mothers, there are no sad mothers, there are no tired mothers," says Maeterlinck in the new act of his play "The Blue Bird." Mothers' ands are always beautiful, and they never really grow old, says Ellen M. H. Gates.

SUCH beautiful, beautiful hands!
They're neither white nor small;
And you, I know, would scarcely think
That they were fair at all.
I've looked on hands whose form and hue
A sculptor's dream might be;
Yet are those wrinkled, aged hands
Most beautiful to me.

Such beautiful, beautiful hands!
Though heart were weary and sad,
These patient hands kept toiling on,
That the children might be glad;
I always weep, as looking back
To childhood's distant day,
I think how those hands rested not,
When mine were at their play.

Such beautiful, beautiful hands!
They're growing feeble now,
For time and pain have left their mark
On hands, and heart, and brow.
Alas! alas! the nearing time,
And the sad, sad day to me,
When 'neath the daisies, out of sight,
These hands will folded be.

But oh, beyond this shadow land,
Where all is bright and fair,
I know full well these dear old hands
Will palms of victory bear;
Where crystal streams through endless years
Flow over golden sands,
And where the old grow young again,
I'll clasp my mother's hands.

A MAN'S REQUIREMENTS

These simple lines are full of charm. They picture for us true love in many phases. They were written by Elizabeth Barrett Browning, one of the most inspired of women poets.

LOVE me, sweet, with all thou art,
Feeling, thinking, seeing;
Love me in the lightest part,
Love me in full being.

Love me with thine open youth
In its frank surrender;
With the vowing of thy mouth,
With its silence tender.

Love me with thy azure eyes,
Made for earnest granting;
Taking colour from the skies,
Can Heaven's truth be wanting?

Love me in thy gorgeous airs,
When the world has crowned thee;
Love me kneeling at thy prayers,
With the angels round thee.

Love me pure, as musers do
Up the woodlands shady;
Love me gaily, fast and true,
As a winsome lady.

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HOW GROTIUS LEFT THE CASTLE

CONTINUED FROM 2508

GROTIUS, or Hugo van Groot, to give him his Dutch name, was a famous scholar, writer, and politician, born in the reign of the great Queen Elizabeth. He spoke and wrote boldly what he thought to be right in politics and religion, and so offended the Dutch Government that they condemned him to imprisonment for life, and took away all his property. They shut him up in the castle of Louvestein, but allowed his wife to stay with him.

Now, the wife of Grotius was a clever woman, and devoted to her husband, and she set her wits working to try to find a way of escape for him. But it was not till eighteen months had passed by that a way was found which promised anything like success.

Grotius spent his time in writing, and often needed to borrow books from outside the prison to help him in his work. He got permission to borrow what books he wanted, and they were sent to him in a large trunk. As he finished with the books, he returned them to a friend outside the castle, and took the opportunity of putting into the trunk clothes which needed to be washed. The guards of the castle used to open the trunk and search it, but they never found anything more dangerous than the books and linen of the prisoner.

This went on until the guards grew tired of searching the trunk, and the keen eyes of Madame Grotius noticed how they were wearying of their duty. In a flash she saw a possibility of escape for her husband. If she could only get *him* into the trunk! First of all she made some holes in it to admit air. This being done, she persuaded her husband to sit by the fire and pretend to be ill.

On the day that the trunk had to be sent away, she helped Grotius into it, and fastened down the lid. Then, when the man came to carry away the trunk, he found the bed curtains drawn, and the wife with finger to her lips urging quiet for the sake of the invalid. The man hoisted the trunk on his shoulders, exclaiming at its weight; but he carried it away.

And so Grotius was taken to the house of a friend, and then, dressed like a miller, he got away to Antwerp.

But what of his wife, who had risked so much for her husband? At first she thought to delay discovery by dressing in her husband's clothes, and sitting crouched over the fire. But no gaoler appeared; so, allowing time for her husband to get away, she went to the guards, told them their prisoner had escaped, and scolded them for failing to do their duty. Taken aback, they let Madame Grotius walk out of the castle, and soon after she joined her husband.

THE BRAVE FRENCH MAID OF NOYON

AT a house in the little town of Noyon, in France, something had gone wrong with the drains, and workmen had to be sent down to open the drain and clean out the sewer. That is a dangerous thing to do, because of the poisonous gases that are in a sewer.

In this case, four men were busily at work when they were overcome by the sewer-gas, and were unable to give the signal to be drawn up out of the sewer.

The people in the house wondered what was the matter, and grew alarmed, but no one dared venture down.

Then a brave servant maid, a girl of seventeen, in pity for the poor men, begged to be tied to the rope and let down into the sewer.

This was done, and she reached the group of men lying helpless down below. As quickly as her trembling hands would allow her, she tied one man to the rope, and jerked it as a signal for drawing him up. Willing hands hauled up the burden, and on reaching the surface the unconscious man was still alive.

A second time the girl tied a man to the rope, and he was drawn into safety. But the next time the girl found the dangling rope come down for her to catch, she was gasping for breath. She struggled against the feeling of suffocation, and tried to fasten the third man to the rope.

This she just managed to do, but she herself would soon have been unconscious, so, with a desperate effort, she wound her long hair round the rope and tied it tightly. Then she lost consciousness; but the watchers above carefully, very carefully, pulled the double burden up into safety, just in time.

The fresh air soon revived the girl, and then she bethought her of the fourth man down in the dangerous sewer. It was hardly likely that he would still be alive; but there was a slight chance, and so again, the fourth time, this noble girl risked her life. But this time her effort was in vain, for the poor man was drawn up lifeless.

The French nation loves to reward a brave action, and some handsome gifts found their way to the unselfish maid who so cheerfully and readily risked her own life for the sake of others.

THE DEVOTION OF A ROMAN

IN ancient days the city of Rome was only one among several states in the middle of Italy, though at the time of which we are telling she was already the most powerful among them all. And because the other cities feared her power, having no mind to be made, one by one, the subjects of Rome, many of them, who were all called Latins, made a league against her. They gathered an army together and went up against the Romans, and the Roman army went out to meet them.

The Romans were under the command of two consuls, both of them known as valiant men. The one was Titus Manlius, surnamed Torquatus, because in his youth he had overcome in single combat a gigantic warrior of the Gauls who wore about his neck a collar of gold called a torque, which torque belonged to Manlius after he had slain the Gaul. And the other was Publius Decius Mus, who, when he was not yet in chief command, had saved the consul from defeat by his skill and valor. So these two men led their forces to the neighborhood of Mount Vesuvius.

Now, the old Romans believed that when men died their souls were borne away to the underworld, where the gods ruled who were called Dei Manes; and they thought that the entrance to the underworld was hard by Mount Vesuvius, where the army was now encamped. Moreover, the two consuls, Manlius and Decius, dreamed each of them the same dream, in which they beheld a mighty form, veiled, which spoke to them, saying: "If the leader of the Romans shall devote himself to the Dei Manes, the Romans will vanquish the Latins; but if the Latin leader shall devote himself, then the Latins will vanquish the Romans." Now, to devote themselves meant to die willingly for the sake of their country.

So, when Manlius and Decius met on the morrow to hold counsel, they learned how each had dreamed the same dream; and each was ready to devote himself to the gods for the sake of Rome, according to the vision. Thereupon the two agreed that when they came to battle with the Latins, each leading a wing of the army, and the Latins should get

THE BRAVE ROMAN CONSUL, DECIUS MUS, GOING TO DIE FOR THE SAKE OF ROME

the better of one wing, then the one who commanded there should devote himself to the Dei Manes, and hurling himself upon the foe, should give up his own life, and thus ensure the victory to Rome.

Now, when the Romans and the Latins were set over against each other in battle array, and the armies met in the shock of combat, it befell that, on the wing where Decius commanded, the Latins made so fierce an onset that the front ranks of the Romans were driven back upon the second line. Then Decius knew that the hour had come. Thereupon he summoned the chief of the priesthood, who was called the Pontifex Maximus, and solemnly dedicated himself for a sacrifice to the Dei Manes, according to the sacred rites of the Romans. Having girded his robes in the manner of one about to offer a victim on the altars of the gods, he rushed upon the ranks of the Latins; and the Roman historian Livy tells us that he appeared in the view of both armies as a being much more majestic than a mere man, and as one sent from heaven to help his friends and bring destruction upon their enemies. Wherever he was carried by his horse, there the Latins were seized with panic, and though Decius fell, pierced by darts, the Romans fought with fresh ardor and the Latins fled in terror all along that wing. A messenger was sent posthaste to Manlius, on the other wing, to tell him how the bidding of the vision had been accomplished, and that Decius was slain.

Men said that Manlius was sorely grieved, because, but for the compact between them, it might have been granted to him to perform the act of self-sacrifice instead of Decius. But when the Latins understood what had befallen, as well as the Romans, both Romans and Latins believed that the gods were on the Roman side, giving to them the assurance of victory, and to the Latins the assurance of defeat; and so the promise of the vision was fulfilled, and the Romans were victorious.

THE MOTHER OF THE GRACCHI

THERE was once a very gracious and beautiful lady in Rome named Cornelia. She might have married a king, but she preferred to be the wife of a Roman citizen. Her husband's name was Gracchus, and her two sons were called the Gracchi. She loved them devotedly, educated them in virtue and manliness, and trained them to be noble citizens of Rome.

One day there came to her home a fashionable lady, who is thus described by old Robert Burton: "Some light housewife belike, that was dressed like a May lady, and, as most of our gentlewomen are, was more solicitous of her head-tire than of her health, that spent her time between a comb and a glass, and had rather be fair than honest (as Cato said), and have the commonwealth turned topsy-turvy than her tires marred."

This fashionable companion lady "did nought but brag of her fine robes and jewels," and the noble Cornelia listened with patience, because she was hostess to the other, and showed nothing of the disdain she felt for the poor frivolous creature.

But presently the grand lady said to Cornelia: "You must have jewels, too. Pray show me your most precious things, for I love to look upon jewels."

CORNELIA SHOWING HER "JEWELS"

Then Cornelia rose and went out of the chamber, and presently returned, leading by the hand her two manly sons. "These," said she, "are the only jewels of which I can boast."

Those sons grew to be heroic men, and all Rome knew that the mother had made them valiant and upright. In her own lifetime, a statue was raised to Cornelia, and on it was written: CORNELIA MATER GRACCHORUM, meaning CORNELIA, MOTHER OF THE GRACCHI.

To be the mother of heroic men is a great destiny. The name of Cornelia will live for ever, and her famous sons are chiefly now remembered because they had so great and good a mother, and did credit to her training.

THE KING WHO DIVIDED HIS GOODS

A KING made a proclamation that whoever would come to him should receive whatever he cared to ask. The nobles came and asked for dukedoms and riches, and when they had been supplied, the poor people came and asked for similar gifts.

"You are too late," said the king to the poor folk. "The nobles have already had everything that I possess in this way. The only thing I have left is my power and authority as king. No one asked for this, and so I give it to you, that you may be the judges and masters of these rich nobles.

When the wealthy men heard what the king had done, they came imploring that he would withdraw such a gift.

"We cannot have these wretches to rule over us," they said.

"I do you no wrong," replied the king. "You had what you asked for, and took, as you thought, everything, so that there should be nothing left for the poor. Divide what you have with them, and I will resume my power."

The nobles felt that this was the best thing they could do, and so the poor received a share and were made comfortable.

THE NEXT GOLDEN DEEDS BEGIN ON PAGE 2813.

THE STORIES OF CHARLES DICKENS

WE have already seen that Dickens often wrote his stories "with a purpose." Just as "Oliver Twist" did a great deal to expose the ill-treatment of the pauper poor, so did "Nicholas Nickleby" expose the terrible state of boarding-school life about the time when the story was written, 1838. Indeed, it was the death-knell of all such schools as Dotheboys Hall, which only needed to be exposed in order that they might be put out of existence. In "Martin Chuzzlewit" there is not the same direct purpose; there the great author is only concerned with the study of interesting characters and the development of an entertaining story.

NICHOLAS NICKLEBY

CONTINUED FROM 2568

IN the earlier part of last century the private schools of England were very unlike those of the present day. Anybody who cared could start a school and conduct it without the least regard to the welfare of the scholars. It is hardly possible for us to realize what many of these schools were like. In Yorkshire, particularly, the worst of them were to be found. The masters and mistresses were usually ignorant, brutal tyrants, who were totally unfit to teach the boys placed under their care, and who lived by starving their pupils and thrashing them so that they were afraid to say how badly they were treated. Many of the teachers could not have written a sentence of proper English, and knew no more of grammar than their most ignorant pupils. With the splendid endowed schools of to-day and the system of inspecting private schools, the life of the boarding-school boy or girl in England is happy compared with the awful existence of torture which the young people of the earlier years of the nineteenth century had to endure. But this is only by way of introduction to the story of Nicholas Nickleby.

The hero of this great romance was not entirely a blameless and heroic young man. He was inclined to let his temper get the better of him at times, and did many things which were the result of his inexperience; but, none the less, he was at heart a good son and brother, a loyal friend, and one who tried his best to do his duty under circumstances which were often difficult and heart-breaking. His father had been a gentleman, but had lacked the common-sense and prudence which would have helped him to make the lives of his wife and children easier after he had gone; at his death he left Mrs. Nickleby and her children, Nicholas and Kate, quite unprovided for. Nicholas was about nineteen, and Kate a year or so younger; they had both been well instructed, but the youth was quite without any plan of earning a livelihood for himself, far less helping his mother and sister. Mrs. Nickleby herself was a foolish, gossiping woman, with no ability, and little was to be expected from her in the way of solving the great question of how to live. Indeed, she was largely to blame for their poverty, as she had advised her husband to speculate with the £1,000 ($5,000) which he possessed, and that had been his ruin, for he lost it all, and was so distressed at the loss that he sank into despair and died.

It was at this point that the brother of the late Mr. Nickleby, Ralph, made his appearance on the scene. He was a man who made money in the City of London in doubtful ways; a miser, unscrupulous, and altogether unlike his dead brother. Mrs. Nickleby was flattered by the visit of this person, and urged Nicholas to pay every attention to what the miserly uncle had to suggest for his welfare. Mr. Ralph Nickleby began by reading this advertisement to Nicholas.

"EDUCATION. At Mr. Wackford Squeers's Academy, Dotheboys Hall, at the delightful village of Dotheboys, near Greta Bridge, in Yorkshire, Youths are boarded, clothed, booked, furnished with pocket-money, provided with all necessaries, instructed in all languages, living and dead, mathematics, orthography, geometry, astronomy, trigonometry, the use of the globes, algebra, single stick (if required), writing, arithmetic, fortification, and every other branch of classical literature. Terms, twenty guineas per annum. No extras, no vacations, and diet unparalleled. Mr. Squeers is in town, and attends daily, from one till four, at the Saracen's Head, Snow Hill. N.B.—An able assistant wanted. Annual salary £5. A Master of Arts would be preferred."

FIVE POUNDS A YEAR AS A START ON THE ROAD TO FORTUNE

"There!" said Ralph, folding the paper again. "Let him get that situation, and his fortune is made. If he don't like that, let him get one for himself. Without friends, money, recommendation, or knowledge of business of any kind, let him find honest employment in London which will keep him in shoe-leather, and I'll give him a thousand pounds. At least," said Mr. Ralph Nickleby, checking himself, "I would if I had it."

"If I am fortunate enough to be appointed to this post, sir," said Nicholas, doubtfully, "for which I am so imperfectly qualified, what will become of those I leave behind?"

"Your mother and sister, sir," replied Ralph, "will be provided for, in that case (not otherwise), by me, and placed in some sphere of life in which they will be able to be independent. That will be my immediate care; they will not remain as they are one week after your departure, I will undertake."

NICHOLAS BUILDS HIS CASTLES IN THE AIR AND DREAMS OF HAPPINESS

"Then," said Nicholas, starting gaily up, and wringing his uncle's hand, "I am ready to do anything you wish me. Let us try our fortune with Mr. Squeers at once; he can but refuse."

"He won't do that," said Ralph. "He will be glad to have you on my recommendation. Make yourself of use to him, and you'll rise to be a partner in the establishment in no time. Bless me, only think! If he were to die, why, your fortune's made at once."

"To be sure, I see it all," said poor Nicholas, delighted with a thousand visionary ideas that his good spirits and his inexperience were conjuring up before him. "Or suppose some young nobleman who is being educated at the Hall were to take a fancy to me, and get his father to appoint me his traveling tutor when he left, and when we came back from the Continent, procured me some handsome appointment. Eh, uncle?"

"Ah, to be sure!" sneered Ralph.

"And who knows, but when he came to see me when I was settled—as he would, of course—he might fall in love with Kate, who would be keeping my house, and—and marry her, eh, uncle? Who knows?"

What an absurdly romantic picture for a young man to build upon—the prospect of being employed by one of the most notorious of the scoundrels who kept the private boarding-schools of Yorkshire! Poor Nicholas was soon to realize how foolish were his dreams, what a ruffian he had for an uncle. But he got the post of assistant, and great was his disappointment.

HOW MR. AND MRS. SQUEERS KEPT THEIR SCHOOL AT DOTHEBOYS HALL

Mr. Wackford Squeers himself was a dirty, ugly, undersized man with one eye, and that an evil one. His whole person was enough to make any healthy boy hate him, yet many parents had foolishly let their children pass into his hands and those of his no less horrid wife, who added greatly to the misery of the scholars by the way in which she treated them. The Squeers robbed the boys of their pocket-money, stole their clothes and gave them tattered garments in their place, while their own son was dressed in the best of the stolen clothes.

Dotheboys Hall was a tumble-down place, dirty and unkempt to the last degree, the schoolroom looking as though it had never once been clean. The boys who were there were also in keeping with the place; Nicholas had never seen such a collection of half-starved, ill-treated little wretches, nor thought so many could have been got together in the one place. On certain mornings the boys were given a physic of treacle and brimstone.

"Mrs. Squeers stood at one of the desks, presiding over an immense basin of brimstone and treacle, of which delicious compound she administered a large instalment to each boy in succession, using for the purpose a common wooden spoon, which might have been originally manufactured for some gigantic top, and which widened every young gentleman's mouth considerably, they being all obliged, under heavy corporal penalties, to take in the whole of the bowl at a gasp. In another corner, huddled together for companionship, were the little boys who had arrived on the preceding night, three of them in very large leather breeches, and two in old trousers, a something tighter fit than drawers are usually worn; at no great distance from these was seated the juvenile son and heir of Mr. Squeers, a very striking likeness of his father, kicking, with great vigor, under the hands of Smike, who was fitting upon him a pair of new boots that bore a most suspicious resemblance to those which the least of the little boys had worn on the journey down—as the little boy himself seemed to think, for he was regarding the appropriation with a look of most rueful amazement. Besides these, there was a long row of boys waiting, with countenances of no pleasant anticipation, to be treacled; and another file, who had just escaped from the infliction, making a variety of wry mouths indicative of anything but satisfaction. The whole were attired in such motley, ill-sorted, extraordinary garments as would have been irresistibly ridiculous, but for the foul appearance of dirt, disorder, and disease with which they were associated."

Brimstone-and-treacle morning at Dotheboys Hall.

We can imagine after this how sad was the heart of simple Nicholas, who knew nothing of the life that was lived outside the quiet circle of his own old home. He was horrified by all he saw at Dotheboys Hall, and most of all by the inhuman way in which poor Smike, a half-witted lad, was treated by the Squeers. Smike clung to Nicholas as a protector, and when at length Nicholas determined to go away and leave the hateful place, poor Smike ran away from the school to follow him.

Perhaps the fact that Fanny Squeers, the daughter of his master, had fallen in love with him, and did everything to make him uncomfortable when he refused to fall in love with her, was another good reason for Nicholas betaking himself far away from Dotheboys. What was Nicholas now to do? He had broken his promise to his uncle, and could not look to him for help. On leaving London, he had received a letter from one Newman Noggs, a poor clerk in Ralph Nickleby's office, telling him, if he ever needed help, to come to him at a certain address.

Poor Newman had once been a gentleman "with horses and hounds," but had acted foolishly, lost his money, and was now reduced to the unpleasant work of serving the miserly Nickleby in the City of London. At length Nicholas went to him, and through Newman he became tutor to the four quaint little daughters of the Kenwigs, with their hair in two straight plaits, tied at the ends with bright ribbons.

A fine employment for a young gentleman; the salary five shillings a week! But we cannot follow Nicholas in all his adventures, which were the outcome of his ignorance of the world. He became an actor for a time in the company of Mr. Vincent Crummles, an eccentric but kind-hearted theatrical manager, and poor Smike—who turns out to be the cousin of Nicholas, and son of Ralph Nickleby—was also employed by Crummles, though Nicholas found him a hopeless pupil.

Meanwhile, Ralph Nickleby had been trying in vain to get Kate to become friendly to Lord Verisopht, to carry out an evil scheme of his, and the Squeers were conducting Dotheboys on the old lines. At length Nicholas fell in with the Cheeryble Brothers, two old gentlemen who were rich merchants, but had once been poor boys.

THE CHEERYBLE BROTHERS HELP NICHOLAS TO MAKE A FORTUNE

It was their whole delight to do good and charitable acts, and Nicholas became their clerk, and eventually a partner in their firm. His fortune is now certain, and out of many trials happiness is coming, not only for Nicholas but for several others, while punishment will be meted out to those who deserve it.

Another miserly old man, in some ways like Ralph Nickleby, but not so great a villain, would have his daughter Madeline, a lovely and affectionate girl, marry a man she hates; but he dies of heart trouble before he can force her to the wedding, and she is free to marry Nicholas, whom she loves, while Ralph Nickleby loses his money in the end, and hangs himself, all his efforts to induce his niece Kate to think of the stupid Lord Verisopht having been in vain, and Kate is reserved for the happier fate of becoming the wife of Frank Cheeryble, the nephew of the kind merchants who made the fortune of Nicholas. Newman Noggs, too, is happy and comfortable in his old age, for, having prevented a scheme of Ralph Nickleby's to swindle the Cheeryble Brothers, those gentlemen proved their gratitude by providing for him.

There are many other characters in this famous story, and we should be delighted if we could follow their history here; but it is impossible. The fate of Dotheboys, however, must be mentioned. For the villainous Squeers at last brought himself within the clutches of the law by stealing an important document, and was sentenced to be transported. When news of this reached the school, it was the signal for a rebellion.

"It was one of the brimstone-and-treacle mornings, and Mrs. Squeers had entered school, according to custom, with the large bowl and spoon, followed by Miss Squeers and the amiable Wackford, who, during his father's absence, had taken upon himself such minor branches of the executive as kicking the pupils with his nailed boots, pulling the hair of some of the smaller boys, pinching the others in aggravating places, and rendering himself in various similar ways a great comfort and happiness to his mother. Their entrance, whether by premeditation or a simultaneous impulse, was the signal of revolt.

THE SCHOOL AT DOTHEBOYS HALL BREAKS UP FOR EVER

"While one detachment rushed to the door and locked it, and another mounted the desks and forms, the stoutest (and consequently the newest) boy seized the cane, and, confronting Mrs. Squeers with a stern countenance, snatched off her cap and beaver-bonnet, put it on his own head, armed himself with the wooden spoon, and bade her, on pain of death, go down upon her knees and take a dose directly. Before that estimable lady could recover herself, or offer the slightest retaliation, she was forced into a kneeling posture by a crowd of shouting tormentors, and compelled to swallow a spoonful of the odious mixture, rendered more than usually savoury by the immersion in the bowl of Master Wackford's head, whose ducking was entrusted to another rebel. The success of this first achievement prompted the malicious crowd, whose faces were

THE TABLES TURNED ON MRS. SQUEERS

The boys make her **take** her own brimstone and treacle.

clustered together in every variety of lank and half-starved ugliness, to farther acts of outrage. The leader was insisting upon Mrs. Squeers repeating her dose, Master Squeers was undergoing another dip in the treacle, and a violent assault had been commenced on Miss Squeers, when John Browdie, bursting open the door with a vigorous kick, rushed to the rescue. The shouts, screams, groans, hoots, and clapping of hands suddenly ceased, and a dead silence ensued."

John Browdie, was a fine, old-fashioned Yorkshire grain-dealer, who knew of the state of things at Dotheboys from having befriended poor Smike when he ran away to join Nicholas. Mr. Browdie quelled the riot, but told the scholars to leave the hateful place, which they did without more ado, and Dotheboys Hall broke up for ever.

THE STORY OF MARTIN CHUZZLEWIT

IN a little Wiltshire village near Salisbury there used to stand a comfortable inn, the Blue Dragon, owned by a very comely, plump, and dimpled widow named Mrs. Lupin. She had "roses on her ample skirts, and roses on her bodice, roses in her cap, roses on her lips," bright black eyes, and jet-black hair. A charming, cheery picture indeed! The night before our story begins there had come to her inn an old man, and with him was a very pretty girl of about seventeen years. Mrs. Lupin was naturally curious, and could not understand how these two were related; they were not father and daughter, and could not be husband and wife. Now, this gentleman was old Martin Chuzzlewit, and he had a very peculiar character. He had adopted Mary Graham, an orphan, and, although he gave her an annual allowance, he had vowed to leave her without a single penny when he died. He was very rich and, as you will see, very eccentric. He had been troubled so greatly by poor relations, who professed to be his friends on account of his money, that he determined that before he died he would have his revenge on them for their greed. Martin Chuzzlewit had been traveling, and had come to the Blue Dragon to rest for a time because of ill-health. Close by lived one of his relatives—the one he hated most of all!

MR. PECKSNIFF, THE HYPOCRITE, AND HOW HE MADE HIS LIVING

The name of this person was Seth Pecksniff, an architect—a man who was regarded by all the villagers as one of the best and saintliest of men. He wore his iron-grey hair brushed off his forehead and standing bolt upright; his eyelids were heavy, and his manner was soft and oily. His wife was dead, but he was not a lonely man, for he had two daughters, Charity and Mercy, or, as he called them, Cherry and Merry. The elder was very prim and stiff; the younger one very kittenish and playful. Mr. Pecksniff called himself an "architect and land surveyor," but nobody ever knew of any house he had built, or of any land he had surveyed, except that which he could see from his own windows. You might wonder, then, how he made any money, but it was made by his having pupils to whom he taught architecture. They lodged with him, and usually they left before long, calling him dreadful names and hating him very much; but he would cast his eyes up to the ceiling and look greatly hurt at such treatment. The one person who admired him through all was his timid, good-hearted assistant, Tom Pinch.

YOUNG MARTIN CHUZZLEWIT BECOMES THE PUPIL OF MR. PECKSNIFF

Mr. Pecksniff expected a new pupil, and he was rather alarmed that he should happen to be a Martin Chuzzlewit, the grandson of the visitor at the inn. He sent Tom Pinch to Salisbury to meet him and bring him home, and Tom was delighted at the thought of his driving to town; it was quite like an adventure, and he was proud of his importance. He was too simple-hearted to notice any selfishness in Martin desiring the whole of the fire for himself, or that he was obliged to sit in the trap with the new pupil's trunk under his feet, so that he could see scarcely anything but his knees. Mr. Pecksniff and his daughters welcomed Martin to the house, and overwhelmed poor Tom with attentions which embarrassed him; he was not used to much kindness, but as he believed no ill of anyone in the world, perhaps that did not matter.

Before young Martin had time to settle down thoroughly in his new home, Mr. Pecksniff found that he would have to go to London on important business; so he left the two young men in charge of the house, taking with him his two fond daughters. They had been in London for a day or so, when Mr. Pecksniff was summoned on his business, which seemed to be very secret.

Now, we must know that when old Martin had been at the Blue Dragon he had an interview with Mr. Pecksniff, in which he told that hypocrite a few unpleasant truths about himself. It was he who now wished to meet him in London.

OLD MARTIN BEGINS HIS LITTLE PLOT TO UNMASK MR. PECKSNIFF

When Mr. Pecksniff went to see old Martin, he took with him Merry and Cherry, who were, of course, charmed to know the old man, and greatly delighted at a proposed new arrangement between the cousins. Old Martin, it now appeared, wished to board with the Pecksniffs in their house, and, of course, Mary Graham must come too. But first he explained that his grandson must go, as he was very angry with him for having fallen in love with Mary.

Before returning to their home, the Pecksniffs visited some other cousins, one of whom, Jonas Chuzzlewit, fell in love with Merry. This Jonas was one of the most hateful of men imaginable, grasping and cruel, and was always reproaching his poor old father because he did not die and leave his money to him! When Mr. Pecksniff was home again he spoke to Tom Pinch, but would not even glance at his pupil. This so enraged the haughty, self-willed young man that he knocked Mr. Pecksniff down, and left his house for ever. But, you see, the wily "architect" had got rid of him.

YOUNG MARTIN AND MARK TAPLEY SEEK THEIR FORTUNES IN AMERICA

There was only one thing now for Martin to do, he thought, and that was to go abroad and make his fortune. So he bade his sweet Mary farewell, and sailed for New York. Mary gave him a valuable diamond ring, which he took, thinking it was from his grandfather; he did not consider others sufficiently to know that she had bought it with her own savings in case he should ever be in want. With him there went an ostler of the Blue Dragon, named Mark Tapley, who adored Mrs. Lupin, and left her employment simply because she was so good to him, and he was so happy there that he thought there was no credit in his being contented. What he wanted was a situation which would make anyone else miserable, and in such a place he would strive to keep "jolly." When he had known young Martin for only a little time, he could see that gentleman had a good deal of selfishness in him, and concluded that here was the very unpromising sort of master to whom he should act as servant.

In New York they went to an office to find out a place which would be suitable for an architect, and spent all their money in buying some land on an island with the pleasant name of Eden. They went by steamboat to this place, but, when they were once landed, there was no means of getting away again! The people of the island were all half-starved skeletons, their houses broken-down hovels, and their own abode a miserable log-cabin. Before long Martin was struck down with fever, and Mark nursed him tenderly, and also did all that he could to help his poor neighbours. Here, at last, he could take credit for being "jolly"—the word which his poor lips strove to frame when he, in his turn, was attacked by the fever, and Martin had to nurse him.

YOUNG MARTIN BECOMES A BETTER MAN THROUGH SUFFERING

To Martin it was not without its benefit, this stern discipline of pain; for whilst he and Mark were recovering, Martin had plenty of time to think of his past life with regret, and to resolve that if he were spared in the future he would show himself to be a changed man; indeed, he almost disappointed Mark, who felt there would soon be no credit in being jolly with such a good master and friend!

But we must turn our thoughts back to the old village in Wiltshire again, where Tom Pinch was never so happy as when he was playing on the church organ, and Mary Graham would steal in quietly and slip out again without his taking any notice of her presence, in case his observing her should frighten her away. One day Mr. Pecksniff came softly into the church, unseen, and fell asleep in a pew When he wakened he heard Tom and Mary talking about him, and he listened to their conversation.

Mary revealed to him Mr. Pecksniff in his true character—how he was a mean, hypocritical, designing man, and how he had proposed marriage to her so that he might gain his own selfish ends. Tom was deeply in love, in his simple, unselfish way, with Mary, and when he knew of this proposal he understood he had been deceived for years in his master. When Mr. Pecksniff reached home, fearing Tom would disclose his knowledge, he discharged him in a way that made it appear he was doing something very painful to himself, but which was the only righteous course for him under the circumstances.

TOM PINCH AND HIS SISTER ARE HELPED IN LONDON BY AN UNKNOWN FRIEND

Going to London, poor Tom met an old friend of his, John Westlock, a former pupil of Pecksniff's, and before long some employment was given to him in such a mysterious way that he did not know who might be his employer, but only that his salary was so good that it enabled him to set up housekeeping for himself with his pretty sister, Ruth, who had been badly treated by some rich people to whose daughter she was governess. But now a sad thing happened to Merry Pecksniff. Although she was the daughter of a deceitful man, she had some good feeling left in her young heart, and many foolish ideas too. She foolishly married her cousin Jonas, whom she rightly disliked, for the sake of spiting her sister Cherry, to whom he had first made love.

The old father of Jonas had died, and Jonas now became friendly with some men who had a large office in the City, seemed very wealthy, and made him feel very proud of himself when they told everyone of his cleverness.

WHAT HAPPENED TO THE WICKED JONAS CHUZZLEWIT

But these flatterers soon robbed Jonas of his hoardings, for he was not so clever as he thought. He had long ago shown his cruelty towards his pretty, silly young wife—he had even struck her—but now his passion at the thought of his lost money knew no bounds. He followed the man who had been the chief cause of his losing his wealth, and in a dark wood he killed him, leaving his body hid amongst the leaves. The murder was discovered, the murderer tracked, and Jonas was guarded in his room until a coach should come to take him to gaol. Bribing the man who watched him with a promise of one hundred pounds, he was allowed five minutes in another room. When the coach arrived he entered, and was driven off; but before the gaol was reached he had freed himself from the power of man, and in his dead hand he held a bottle of poison. Thus poor Merry was left the widow of a murderer. It was also proved that Jonas had tried to poison his father, who had seen through his plan and avoided it. The knowledge of his son's guilt broke the old man's heart, but Jonas himself believed that he had really poisoned him.

But all life is not sorrow, and where trouble comes to those who have been happy, it also happens that good fortune comes to those who have passed through many trials. Young Martin came home again from America with the jolly ostler, who resolved that it would be best to marry Mrs. Lupin and be jolly with her; and the name of the inn was changed to the Jolly Tapley.

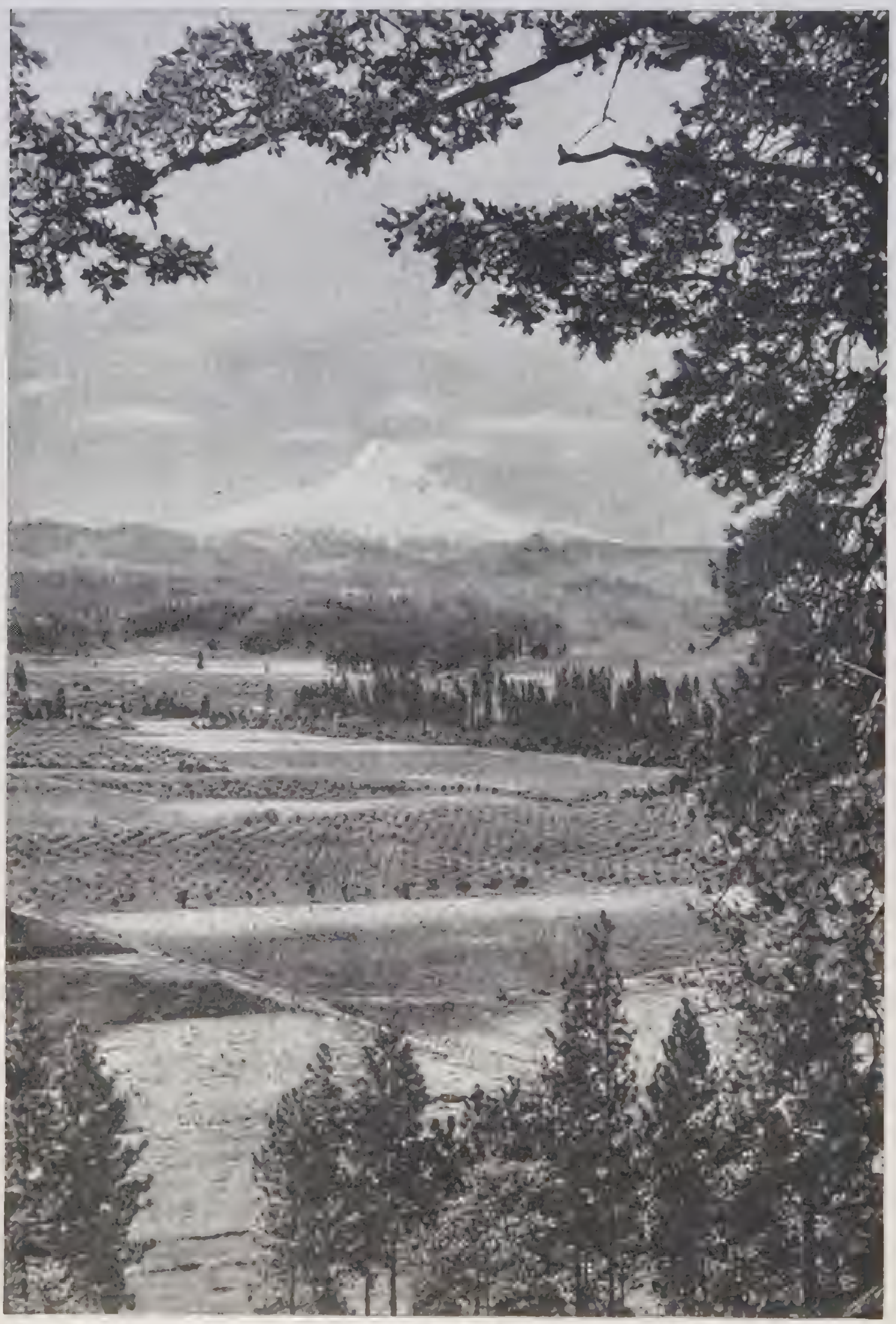
PECKSNIFF IS PUNISHED AND OLD MARTIN MAKES EVERYBODY ELSE HAPPY

Old Martin Chuzzlewit now summoned to him his grandson, Mark, Tom Pinch, Ruth, Tom's old friend, Westlock, and Mr. Pecksniff. Before the whole assembly he told them of his purpose in staying at the house of such a man. He had watched everything that had been done, scarcely able to control himself at times; had pretended friendship for the horrid Pecksniff; but at last he had come to the end of his endurance. He now rose from his chair, and with his stick he felled Pecksniff to the ground; while all stood around, amazed at the old man's anger. From that day Pecksniff put away all pretence of being a good man, and, with his daughter Cherry, fell to begging money from people.

Old Martin Chuzzlewit forgave his grandson freely for all his wilful conduct in the past, and gladly consented to his marriage with Mary. He also told them that he had been Tom's patron, giving him his pleasant situation in London. And now his kindness extended farther, and in his new goodness of heart he strove to console poor Merry for her sorrows, and to show her that she might yet have some happiness in life.

THE NEXT STORIES OF FAMOUS BOOKS ARE ON 2773.

A PICTURE OF NATURE'S FRAMING



This is the peaceful valley of the Hood River in Oregon with snow-covered Mount Hood in the distance. This mountain is in Wasco County and has a height of more than 11,000 feet. The melting snow from its top and sides feeds many streams. Hood River, which gives the valley its name, is one of them. Every year many climb over the glaciers to its summit to enjoy the magnificent view.

A Great Oil Refinery in Richmond, Cal.

THE UNITED NATION

PART II

CONTINUED FROM 2387

IN our last story of our country we told of recent events, and then went on to describe some of the things which our country produces. We spoke of what we may call the vegetable products. Now let us go on to speak of the animal and mineral products. We shall also tell what we make of all their products.

First let us speak of the animals. You have roast beef, or steak, for dinner sometimes, and you know the animal that furnishes them. Perhaps, if you live in the country or in a small town, you have a cow or several cows in the barn, and you know that farmers raise cattle for the butcher. But where does the meat for the great cities come from?

You have perhaps read of the great cattle ranches of the West. There were many of them a few years ago and they included thousands of acres. In other sections were millions of acres of government land over which cattle ranged, living out of doors all winter.

As the population has increased much of this land has been needed for farms, and the great ranches are being broken up. So many cattle can no longer get their living by grazing all the year, but must be fed a part of the time. Though the population increases every year, the number of cattle increases very little, or not at all. Every year beef is becoming higher in price, and it is not likely to be much lower. Texas has the greatest number of cattle.

AMERICAN MEAT SOLD IN EVERY LAND

Nevertheless the United States is still a beef-producing country. We send thousands of animals to Europe alive, though not so many as we did years ago. In some of the western cities are packing houses where the animals are slaughtered and prepared for market. The meat is stored in cold rooms, and when cold is carried in cold cars all over the United States, and may be put in cold rooms on ships and sent all over the world. Many million pounds are also sent in cans.

The humble hog, however, furnishes a larger value than any other animal. Hogs are raised everywhere in the United States, but the largest number may be found in the Mississippi Valley, which also produces the most corn. Iowa raises the largest number, with Illinois and Missouri next. Our country stands at the head of the producers of pork and pork products.

Copyright, 1911, 1918, by M. Perry Mills.

In nearly every state sheep are raised both for food and for their wool, but the greatest number are in western states, as Wyoming and Montana, though Ohio has a large number. In the production of wool our country ranks third in most years. Australia is first, the Argentine Republic is second, and Russia probably fourth, though we know very little about Russian agriculture now. We cannot send any wool abroad but must buy in great quantities in order to get enough to clothe our people.

POULTRY AND EGGS FORM A VALUABLE PRODUCT

You would hardly believe that poultry and eggs are among the most valuable products of our country. Yet it is estimated that two hundred eggs are used in this country, every year, for every man, woman and child. Together poultry and eggs are worth hundreds of millions of dollars every year. The prices change so often that it is difficult to say exactly how much. Illinois usually has the most chickens, but Ohio produced the most eggs at the last census. We produce just about enough for ourselves and have few eggs to send away.

The same is true of butter and cheese though we do send away a little cheese. The value of these two articles of food is more than $500,000,000 a year. Of course, the value of the milk sold in our towns and cities is many millions more. Some of this, you know, is put into cans and sent abroad.

While the sea is not precisely the United States, yet the food gotten from the water is a part of our national wealth. The value of the fish caught by our fishermen is one-sixth to one-fifth of that of the whole world, and we send away great quantities of salmon, which are nowhere else so plentiful as on the western coast of North America. We produce more than four-fifths of all the oysters eaten in the world, and no other oysters are so good.

In order to be certain that the fish will not be caught faster than there are new ones to take their places, the government has built fish hatcheries at many different places. Here the eggs are hatched, and after the little fish are large enough to take care of themselves, they are turned loose in the streams and in the sea. You have learned in another place how some fish eat the eggs of other fish.

THE AMERICAN MULE PULLS WAGONS IN AFRICA

We also raise more horses and mules than we need and these are sent to Europe and even to Africa and Asia. The mule eats less than a horse and will keep strong on coarse, rough food on which a horse would starve. During the South African War, thousands of American mules were bought by the British to pull the artillery and the supply wagons. During the Great War many thousands more went.

MINERAL PRODUCTS OF THE UNITED STATES

Now we come to the third great class of products, which belongs to the mineral kingdom. In minerals the United States is very rich. In fact the value of our production is almost equal to that of all the rest of the world put together, though this will not be true when the great stores of Russia, China and Canada are really opened. Mineral products are divided into metals and non-metals.

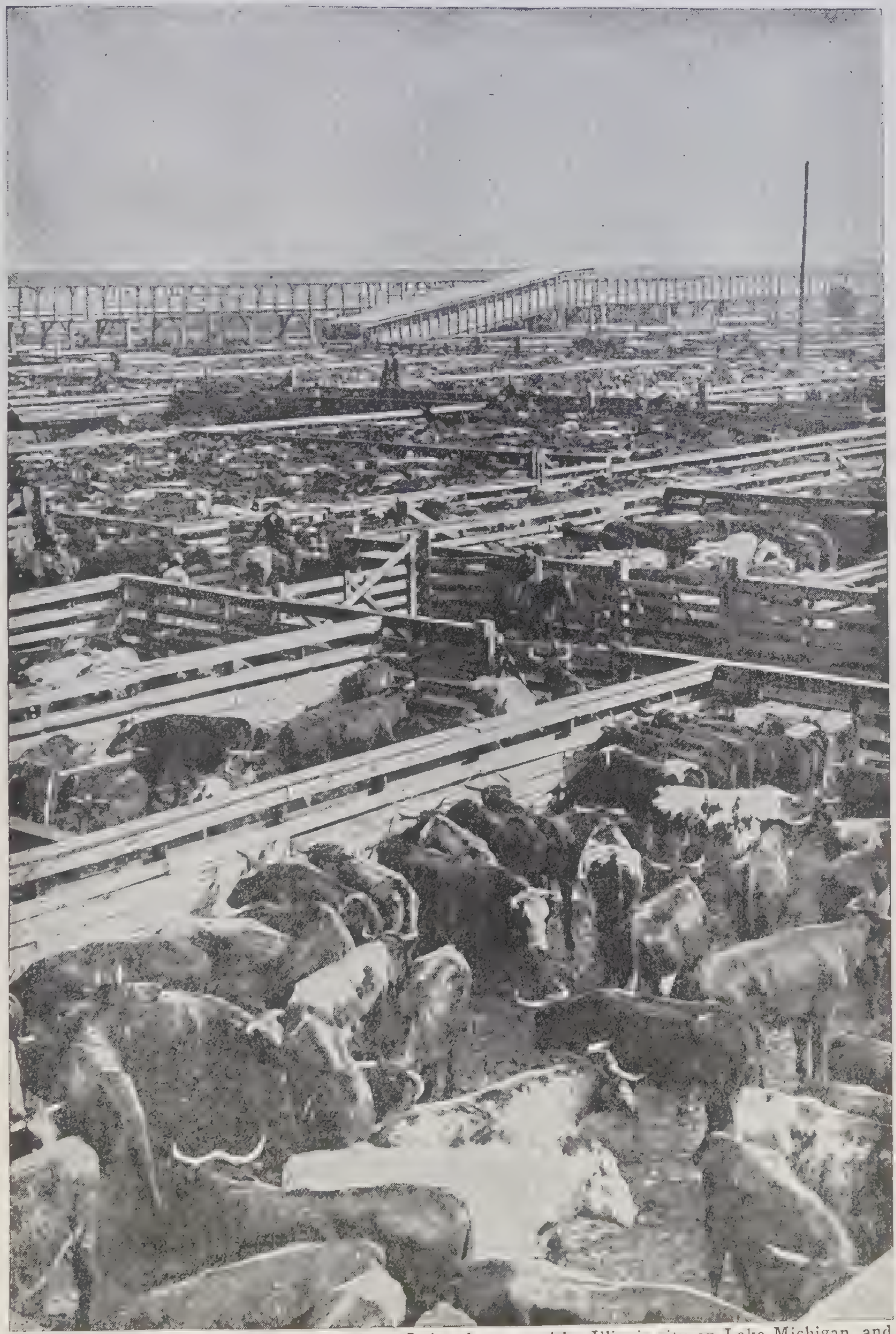
The most valuable of all our metals both in usefulness and in money is iron. Our country furnishes from one-third to two-fifths of the iron of the world, and more than one-third of the steel, which is made from iron. We shall tell you more of how iron is gotten from the ore and how it is then turned into steel in another place. Three states, Minnesota, Michigan and Alabama, furnish most, though some is found in twenty-five states.

OUR COPPER WORTH MORE THAN OUR GOLD

Next in value to iron is copper and of this we furnish about half of the world's supply. Copper is used for many things, but perhaps the most important use is as a conductor of electricity. Nearly all the wires you see over which electricity passes are of copper, and it is also used in electrical machines. It is necessary in making weapons of war. Much of it is also used to cover wooden ships, as it is strong for its weight and the water does not affect it very much. Arizona, Montana and Michigan furnish the most.

Next in value is gold, of which we furnish about one-fifth of all mined in the world. South Africa is first, of course, and then comes our country. California, Colorado and Alaska lead in the order named, and with Nevada and South Dakota, supply about five-sixths of all we produce. Some gold is obtained in about thirty states.

THE GREAT STOCKYARDS OF CHICAGO



Chicago is the world's greatest stock market. It is a huge, wealthy Illinois city on Lake Michigan, and cattle from a thousand miles around are sent to its great stockyards, one corner of which is shown in this picture. These stockyards, or markets, cover 574 acres of ground and give employment to 1,800 workpeople. Many thousands of men and women are employed in the meat industry in Chicago, the most important centre of this trade in the whole world. In the year 1830 Chicago had only a few houses; now it has about two and a half million people. Copyright by Underwood & Underwood, N. Y.

TWO METALS WHICH ARE USUALLY FOUND TOGETHER

The next two metals are almost equal in total value and are almost always found together. These are silver and lead, but in most years the silver is worth a little more than the lead. Generally we produce about one-fourth of the silver of the world, which puts us in second place, with Mexico first. On account of the revolutions in Mexico, production has fallen off, and recently the United States has furnished more than any other country. Montana, Nevada and Utah are almost together, with Idaho not far behind, among our states in the production of this beautiful metal, which has so many uses that you can name.

Lead is used for many purposes, both pure and when mixed with some other metals. Water-pipes and tanks, electric batteries and bullets are all made of lead. When mixed with tin it makes solder, with which the plumber stops the leak in the pipes; mixed with another metal, called antimony, it forms the type metal from which this book is printed. We produce more than any other country—nearly one-third of the yearly supply. Spain, the German Empire and Mexico also furnish large quantities of this metal. In our country, Missouri, Idaho, Utah and Colorado are the leading states.

A METAL THAT IS SELDOM USED ALONE

Zinc is used to cover iron to prevent it from rusting, making what is called galvanized iron. Mixed with copper, it makes brass, which is very useful. Much is also used in the manufacture of paint, in electric batteries and in dyeing. We produce about one-third of the world's supply.

Perhaps you have seen a white metal something like silver but much lighter in weight, called aluminum. This metal is never found pure, but it is one of the most abundant elements in the earth's crust. Most clays contain it, and in combination with other substances it forms beautiful gems in the earth. An American discovered a cheap way of separating it from the substances with which it is combined, and now we produce about half that is used. This metal is likely to be much more freely used in the future, as there is much more of it in the earth than there is of iron, and the price is going down.

The only other important metal is quicksilver or mercury, which you see in thermometers, and which is also used in medicine and in gold mining. More than one-seventh of the supply comes from the United States, nearly all of it from California.

SOME MINERALS THAT ARE NOT METALS

Many things which are minerals are not metals. The most important of these is coal, of which we produce between one-third and one-half of all that is mined, or almost as much as Great Britain and the German Empire together. These three produce most of the coal used, though in Russia and China there are great beds which are hardly worked at all.

Two kinds of coal are mined, anthracite, or hard coal, and bituminous, or soft coal. Pennsylvania furnishes nearly all the anthracite, though Colorado and New Mexico have a little, and also furnishes more bituminous than any other state. West Virginia and Illinois are next, though coal is mined in thirty states.

Next in value is petroleum, of which we furnish much more than any other country, with Russia second. Besides kerosene, gasoline, vaseline and paraffin, many other valuable products are obtained from this oil. It is found in California, Oklahoma, Illinois, Texas, Louisiana, West Virginia, Pennsylvania, Ohio and several other states. Along with oil is almost always found natural gas, for which wells are bored just as they are for oil. Many cities and towns in the United States are lighted and warmed by this fuel, which is conveyed by pipes like ordinary gas. In another place we tell you more of how this great help to mankind is produced.

BUILDING STONE OF MANY KINDS IS NEXT IN VALUE

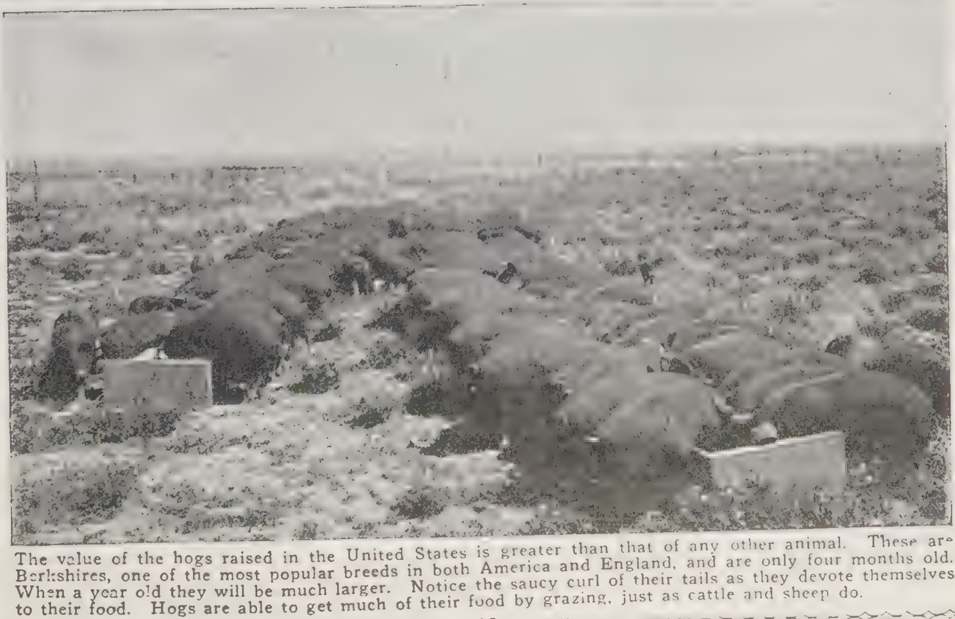
Next in value of our minerals is building stone. Some sort is found almost everywhere, and we have some of the best and most beautiful stones in the world. Marble, the limestones, the sandstones, and granite are the ones chiefly used, and many different colors and degrees of hardness are to be found among them.

Vermont furnishes more marble than any other state, though Georgia and Tennessee also have much beautiful stone of many colors. Nearly every state has some limestone but the quarries of Indiana, Illinois and Kentucky are the most

STOCK-RAISING IN NEW MEXICO

Some parts of New Mexico are becoming noted for fine stock. Indeed it would be difficult to find anywhere better specimens than those shown on this page. The state now stands third in the United States in the production of wool, and some enthusiastic residents say that it will yet rank higher.

This is a part of a herd of thoroughbred Holsteins kept for dairy purposes near Roswell, New Mexico. This breed is one of the best for the purpose as it gives large quantities of good milk even if it is not so rich as that of the Jersey. The silo is beside the shed under which some of the cattle are standing.



The value of the hogs raised in the United States is greater than that of any other animal. These are Berkshires, one of the most popular breeds in both America and England, and are only four months old. When a year old they will be much larger. Notice the saucy curl of their tails as they devote themselves to their food. Hogs are able to get much of their food by grazing, just as cattle and sheep do.

noted. Sandstone is found almost everywhere. Many states have quarries of excellent granite.

TWO MORE VALUABLE MINERALS THAT ARE NOT METALS

Salt is produced all over the world and though the United States makes more than any other nation,—about one-fourth,—we do not have enough for our needs. You are told about the production of salt on page 237.

Glass, about which you are told on page 1263, is, you know, only melted sand. No other country makes so much as we do, for nowhere else are there so many people who can afford to buy glassware for their tables, and to use so much glass in their windows.

SOME OTHER MINERALS FOUND IN OUR COUNTRY

There are dozens of other useful minerals found in the United States. Phosphate rock, used for fertilizer, is valuable, and so is sulphur. Grindstones are worth many thousands of dollars, borax is valuable, and so is mica, much used for stove windows, and other purposes as well. We must not forget the rock from which cement is made, for this grows more valuable every year.

We must acknowledge that Nature has been kind to our country. No other country has such a variety of soil on which so many different kinds of crops can be raised. In no other country do so many animals thrive, and no other country is so rich in mineral wealth. If the United States were shut off from all the rest of the world, it would not make very much difference. We would have to do without some things, but they would not be the most important. The necessities of food, clothing and shelter are all produced. Some tropical products would be lacking, of course.

WHAT DO WE MEAN BY RAW MATERIALS?

It is usual to speak of most of the things of which you have been told above as food products and as raw materials for manufacturing. For example, cotton is the raw material and cloth is a finished product. Iron ore is a raw material, steel rails for a railroad are a finished product. Of course, however, you must remember that the finished product of one factory may be raw material for another. Cloth, for example, is the raw material for a tailor, and flour for a baker.

The United States has become the greatest manufacturing country in the world because it has the greatest stock of raw materials, and because it has cheap coal and much water power. You must remember that power is necessary to run machines, and no matter how much raw material a country has, it cannot become a manufacturing country unless it can get some sort of power to run its machines, and has also a cheap way of carrying raw material to the factories and of taking away the finished goods.

You have already been told of the coal supply of our country, and that it has many swiftly running streams. These streams are made to furnish power by means of water-wheels. Because New England had so many of these streams is one reason why manufacturing developed early in that section.

HOW THE STREAMS HAVE BEEN HARNESSED

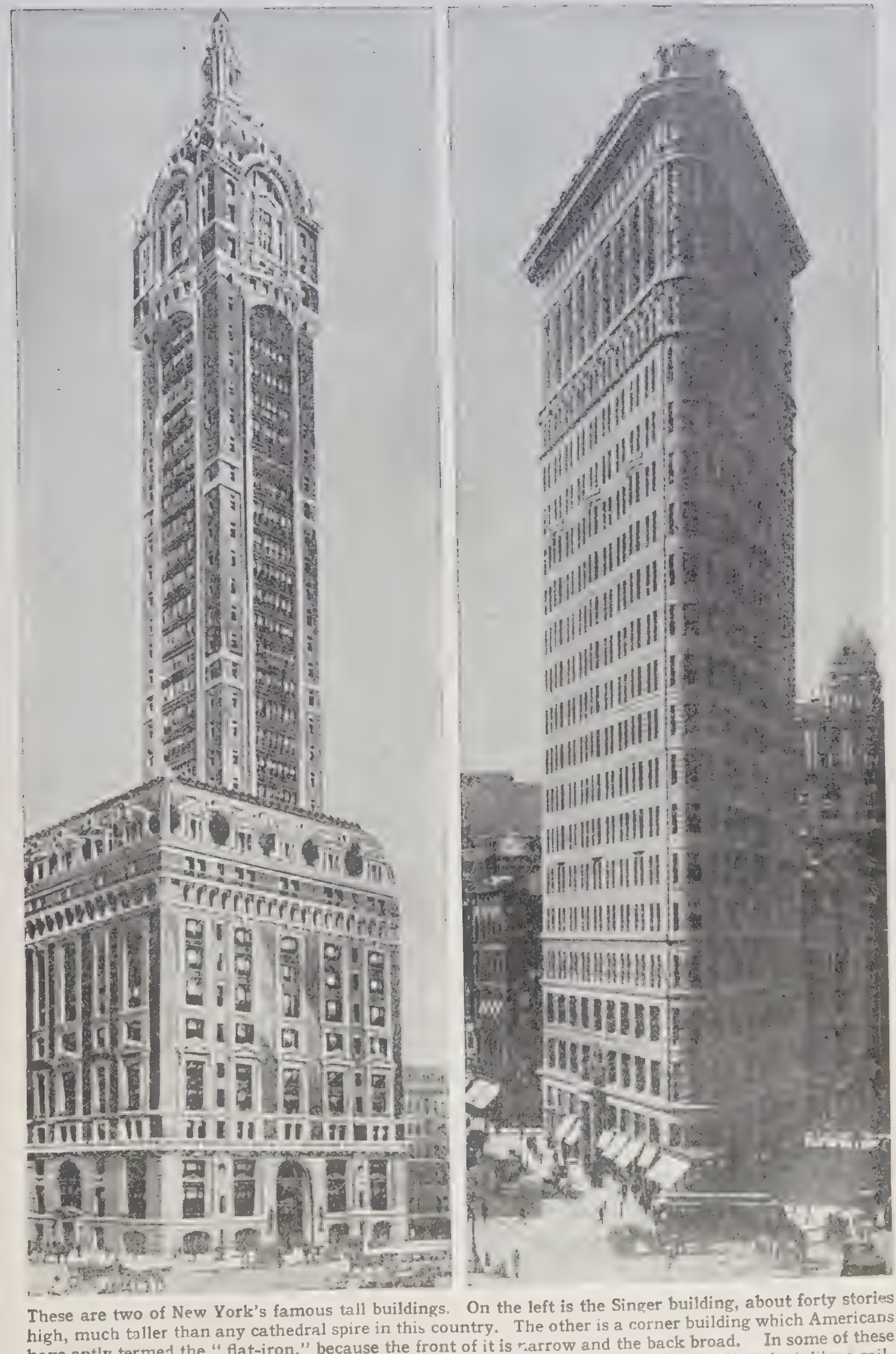
Lately there has been a great increase in the use of electric power. On many streams, great dynamos to develop electric power have been built. The power is then carried by wires ten, twenty, fifty miles away to the factories, which must be built where there are railroads to carry the goods, or where there is a good supply of labor. In many factories, instead of great engines to run the machines you will see only an innocent looking wire running into one corner of the building. And yet this wire carries more power than any number of great engines can develop.

HOW LABOR AND SKILL ADD TO SELLING PRICE

Labor and skill add very much to the value of some kinds of raw material. For example, a lump or scoopful of iron ore costs almost nothing. If made into pig iron it is worth a little more; made into a stove it is worth still more; made into steel for railway rails the value increases still more. The same amount of material made into knife blades is worth a great deal, and then if made into springs for watches, say, is worth many hundreds of dollars.

A pound of raw cotton costs only a few cents. When made into coarse thread the value is increased, and when this thread is woven into cloth the value becomes greater still. Or if the cotton is spun into fine thread and then made into lace, the value may be a thousand times as much as that of the raw cotton.

TWO OF THE WORLD'S HIGHEST BUILDINGS



These are two of New York's famous tall buildings. On the left is the Singer building, about forty stories high, much taller than any cathedral spire in this country. The other is a corner building which Americans have aptly termed the " flat-iron," because the front of it is narrow and the back broad. In some of these buildings as many as 10,000 people work, and the crowds going in and out make the place look like a railway station. There are stairs to the top, and elevators running all day and sometimes all night, some of them " expresses," going without stopping from the street floor to the twelfth, sixteenth, or twentieth story.

OTHER RAW MATERIALS NOT MUCH INCREASED IN VALUE

Some other raw materials are not increased so much in value because not so much labor and skill is spent upon them. A loaf of bread does not cost so much more than the wheat out of which it was made, but even here fine pastry and cakes are sold for much higher prices.

The United States was, at first, as you have been told, almost entirely an agricultural country, but since your fathers were born, it has become also the greatest manufacturing country in the world in the value of products.

We do not yet make the finest goods of every kind, for some of them require very highly skilled labor which requires a long time to train, but every year finer and finer goods are made. In some lines we already surpass any other country, while in others we make only the coarser grades. On some goods you have seen foreign names, or perhaps "Made in Germany." Sometimes these goods have been sold in this country because of quality and sometimes because of cheapness.

THE MOST VALUABLE MANUFACTURES OF THE UNITED STATES

Of all the manufactures of the country those of the greatest value are the food products. These are flour, meal and meat prepared for use, and similar things. They are important because without them we could not live. Minneapolis is the chief centre of the flour, and Chicago of the meat industry.

The next group to be mentioned is that of iron and steel and their products. The chief single item in this group is steel rails for railroads, either steam or electric. We make all our railroads need, and in far away parts of the world you will find engines running on American rails. Pennsylvania is the chief state in such manufacture.

Much of the steel sent abroad goes in the form of electrical and agricultural machinery. Our country is the chief maker of all sorts of farming machinery, about which you may learn in another article. Some of the steel goes into the making of ships though we are not the greatest ship-building country.

Lumber and timber products are very valuable. A large part of agricultural machinery, tools and implements is made of wood. The same is true of horse-drawn vehicles. Motor cars are nearly all metal. Street and railway cars are sometimes made of wood, though metal is being used more and more. Furniture must not be forgotten. In fact the wood products are almost numberless.

CLOTH AND CLOTHING OF MANY KINDS

The next group of our manufactures is the textiles, which means, that which is woven. We may divide this group into wool, cotton, silk and linen. Then besides there are other classes made up of a combination of these. Our woolen manufactures are large, but we send very little abroad, as we need most of our production for our own people. In fact we must buy much raw wool and much cloth also in other countries. Besides cloth there are carpets, stockings and knit underwear, and the like.

We make more knit goods than all of the rest of the world put together, and we make more carpets than any other country. More knit goods are made in New York State than in any other, while in carpets, Philadelphia holds first place. Taking all kinds of woolen goods together, Massachusetts is the first state.

We manufacture much cotton goods though we do not use as much as half our crop of the raw cotton. This industry is almost entirely confined to the Atlantic states. The first cotton mill was built in Massachusetts about 1790, and for many years nearly all the mills were in New England. For about thirty years the number of mills in the South has been increasing, and now there are hundreds of mills in the Southern states and they use more cotton than the Northern.

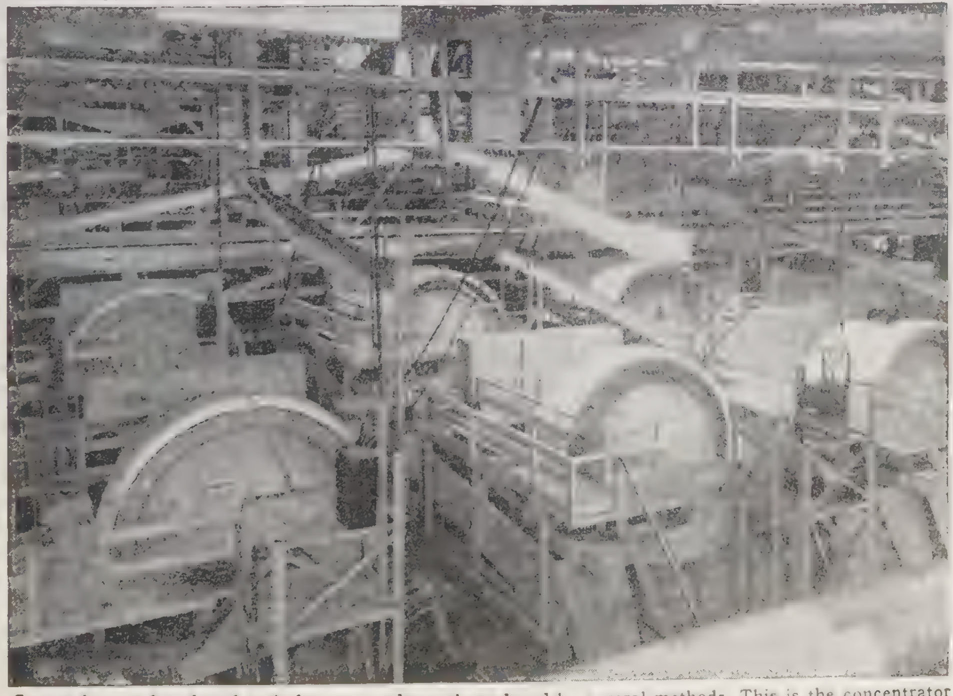
Massachusetts is still the chief state, with North Carolina and South Carolina struggling for the second place, and Rhode Island is fourth. New Hampshire, Georgia and Alabama also manufacture much cotton. We send much cotton cloth to other countries, and some day will probably manufacture a much larger share of our cotton.

OUR SILK AND OUR LINEN MANUFACTURES

Our country uses about one-third of the raw silk of the world, but still we do not manufacture all we need. Nearly all the raw silk used is imported. Though many attempts to raise silkworms in this country have been made for nearly two hundred years, they have not been very successful. No other country uses so

ANACONDA, WHERE COPPER IS KING

The works for smelting copper ore at Anaconda, Montana, are the largest in the world, and the Washoe Reduction Works, which are shown here, produce about one-tenth of the world's supply. The town of Anaconda has grown up around the copper industry. In the mountains around are many large and rich veins of copper ore, and the shafts in the mines go far down, some of them more than two thousand feet.



Copper is not often found entirely pure, and may be reduced by several methods. This is the concentrator floor in the great establishment shown above. When finely crushed ore is placed in oily or acid liquids some of the impurities are separated. The "concentrate" must then go through other processes. Pictures by courtesy of Anaconda Copper Mining Company.

much silk as the United States, because no other people can afford to buy so much. The leading state in silk manufacture is New Jersey, with Pennsylvania next. The city of Paterson, in New Jersey, is one of the chief silk manufacturing cities in the world.

Though we grow very little flax for spinning, we bring in a great deal to be woven into cloth. The best linens are not made in the United States, however, but we make a great deal of linen crash for towels, besides much linen thread. Some cotton is often mixed with flax and sometimes the product is sold by dishonest merchants as pure linen. Ireland, Holland and France are the great linen countries.

MORE TREASURES WHICH WERE ONCE THROWN AWAY

Next in value is the group known as chemicals, drugs and dyes. This includes fertilizers of many kinds, which furnish food for plant life. They are made from such things as phosphate rock, ground bones, potash, cottonseed meal, and the refuse from slaughter-houses and fisheries. Medicines are made from our native plants or from plants imported from other countries; and many kinds of dyes are also made. We told you in a former volume how the cotton seed was once thrown away. Around gas works and oil refineries only a few years ago there was such a great quantity of a sort of tar left after the gas and oils had been taken out, that it was in the way. Chemists have found in this ugly black substance more hidden treasures. Some of the most valuable medicines used by our doctors are now gotten from it, as well as brilliant dyes. The value is many million dollars, from a substance thought almost worthless.

PAPER AND PRINTING, AN IMPORTANT INDUSTRY

The next of our manufactures in value is paper, or at least paper and printing. When you think of the number of newspapers, magazines and books, the amount of wrapping paper used by the butcher, the grocer and other tradesmen, to say nothing of the number of paper bags used every year, you can easily see how it happens that the value is so great. Then, also, there is paper for writing. Besides, too, there are hundreds of other uses for paper, of which you have probably never heard. Most paper is made wholly or partly of wood pulp. The finest paper is made from rags, but many other fibres are used. The United States produces as much paper as all the rest of the world.

Now we come to leather, as the prepared skins of animals are called. When the skin is removed it soon becomes dry and hard, so hard that it cannot be used for shoes or other purposes. So it must go through many processes to make it soft. We cannot stop to tell how this is done now. The chief animals, the skins of which are used, are cattle, sheep, hogs, goats and horses. We make very little horse or goat leather in this country. In all we make nearly a third of the world's leather, and use up not only the skins of animals obtained in this country, but many from abroad.

The number of carriages, wagons and automobiles is very large and the value is very great, but a part of this value is in the wood and steel already spoken of. Though making motor cars, both for pleasure and business, is a new industry, it has grown very rapidly, and now is one of the largest in the country. Tobacco, too, sells for many millions of dollars. We grow not quite half of all grown in the world. Of this half is used here and half sent to other countries.

There are many other things manufactured in this country which we have not space to mention. Nearly every little town in the states east of the Mississippi has one or more mills or factories of some sort, and there are many in the states west of the great river.

CURIOUS THINGS WHICH THE CENSUS SHOWS US

We learn some curious things if we study the long columns of figures that are sent out from the Census Office in Washington. We find that New York State makes ninety-nine out of every hundred collars and cuffs made in this country; that Connecticut makes about sixty-five out of every hundred clocks, and more than half of the brassware.

Massachusetts makes over half of the boots and shoes, while New York is the centre of the clothing industry, both for men and women. This state made almost nine times as much clothing for women, and almost three times as much for men as any other state, when the last census was taken. Michigan leads all other states in making motor cars. Some-

WORK AND PLAY IN THE FAR WEST

Gathering oranges in a grove like this near the beautiful city of Los Angeles, California, can hardly be considered work at all. You can see blossoms as well as ripe fruit on the trees. The men pick each orange separately so that when a box is packed there will be no bruised specimen. Los Angeles is surrounded by orange and lemon groves, and by fruit gardens, and ships large quantities of all of them.

Though Seattle is one of the busiest cities on the Pacific, the people have not forgotten the need of recreation. The city has a complete park system of nearly 2,000 acres, connected by boulevards, besides many playgrounds. Few cities have done more than Seattle for the general welfare of the whole population. This is Volunteer Park.

Picture by courtesy of Chamber of Commerce, Seattle.

times a state leads because of nearness to the raw material used in an industry. Sometimes the reason seems to be that the first factories built in the state, were successful, and other men were encouraged to build. Factories were built in New England years ago, because there was so much power furnished by the streams.

Now when we learn that a country does much manufacturing, we know that it must have easy ways of getting raw material, and of sending away what its factories make. In Holland you were told that more goods are carried by canal boat than by railway. In many other countries a very large part of all the freight is carried by river or canal.

THE RAILWAYS OF THE UNITED STATES

Though the United States has many rivers, not very much use is made of them as the railroad is quicker. Many canals were dug before the Civil War, but some of them have been allowed to fall into disuse or fill up. Some have been dug recently. Several important canals are in operation, however. The most important is the Erie Canal, of which we have spoken elsewhere, and the Lake Washington Canal at Seattle. About two-fifths of all the miles of railroad in the world are in the United States. The number of miles is more than 250,000.

Some of these railroads run from the Atlantic to the Pacific under one management. You can go from New York to New Orleans without changing cars. The passenger cars on these trains have every convenience and one can go from New York to San Francisco in less time and with less fatigue than the journey from New York to Boston required a hundred years ago. No other people travel so much. If all the distances traveled by passengers in the United States were divided equally it would amount to a journey of three hundred and fifty miles a year for every one of us.

Nearly all the railways use steam locomotives, but some are turning to electricity. In another place we show you some great electric locomotives. There are many light railways which use motors built into the cars, like the street cars or like the elevated or underground railways in our cities. In some parts of the country electric railroads connect the cities and small towns.

WHO ARE THE PEOPLE OF THE UNITED STATES

From the first settlement of the United States there has been more work than there have been workers. In the earliest days, when land was free to all, few people would work on the farms of others when with a little trouble they could get farms of their own. After the Revolution all the unoccupied land became the property of the government, and you have been told how possession of the land beyond the Mississippi was gained.

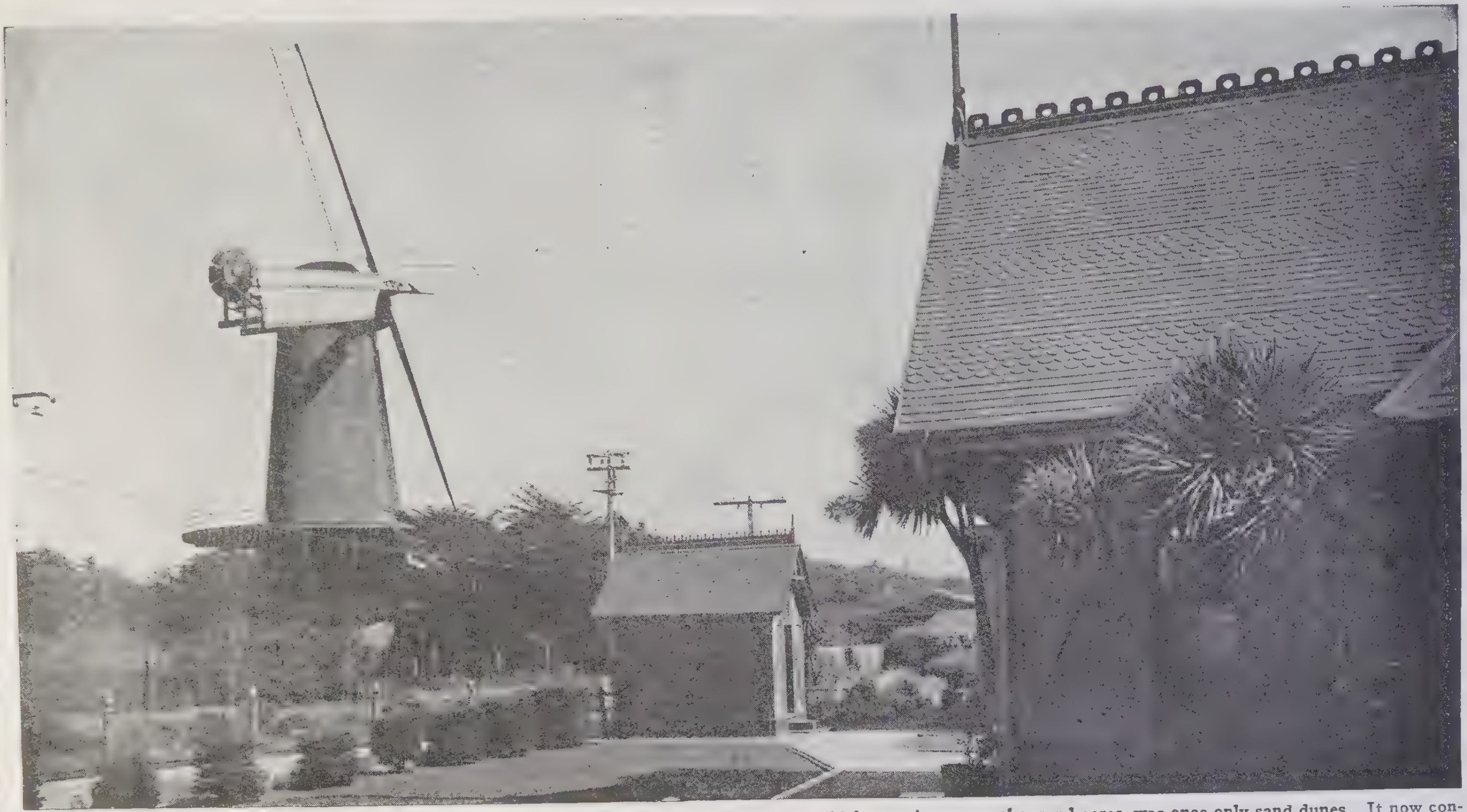
This land was first sold at a very low price to settlers and later the government gave a farm of 160 acres to every man who would work it. Many millions of acres were given away, and now there are fertile farms and thriving towns and cities where there were no inhabitants only a few years ago. The free land is not quite all gone yet.

Now what of the people of our country? You were told in another volume that besides the English, some Scotch, Irish, French, Germans, Swiss and Swedes came to this country before the Revolution. For a time after the Revolution very few foreigners came, but after 1830 the number became larger, but not so many as 100,000 came any year until 1842. Until 1860, nearly all who came were from Great Britain, Ireland and Germany. Since the Civil War the number has increased very greatly. Not so many now come from Great Britain, Ireland, Germany, Norway and Sweden or any other countries of Northern Europe. Many came from Canada before 1895, but fewer come now.

Now the immigrants come from Central or Southern Europe. Russia, Austria-Hungary and Italy furnish the largest numbers. Some come to escape persecution, some to improve their condition, some to avoid military service. Some come intending to spend their lives, while others expect to work a little while, save their money and go back to their native land. Most of them come first to New York, and as they enter the harbor one of the first things they see is the great statue of Liberty with her torch upraised, as a sign that here in this land every one has a chance to make of himself as much as he can.

They are of many races and speak many different languages. They have not been used to free government and many

GOLDEN GATE PARK, THE LARGEST IN SAN FRANCISCO



The west entrance of Golden Gate Park, San Francisco, is near the sea. Much of the park, which contains over a thousand acres, was once only sand dunes. It now contains fields for baseball and other sports, a playground for children, a stadium, a zoological garden, an art museum, beautiful walks and drives besides an amazing variety of trees, shrubs and flowers. There are several of these great windmills, which pump water to supply the lakes in the park. There is a beautiful view of the water from the park. In another place we have shown you the sun setting on the Golden Gate. Other scenes in San Francisco are also shown.

of them are very poor. They are willing to work, however, and to do the kinds of hard and dirty work which the native-born American does not like to do.

Their children go to the public schools, learn to speak English, and many of them go on to high school and college. In New York City are many large merchants and manufacturers who came to this country poor immigrant boys.

THE STATUE OF LIBERTY

On a little island in the middle of the harbor in front of New York towers this magnificent Statue of Liberty, over 300 feet high, greeting the visitor to the United States. The statue itself is 150 feet in height, and was presented to the United States by the French nation in commemoration of the 100th anniversary of the Declaration of Independence, and to show how much they admired the freedom of the American nation. It is made of copper and iron, and the torch held aloft is lighted at night by electricity.

Some well-known doctors and lawyers are the sons of parents who never learned to speak English well. In Europe they would not have had the opportunity to become educated, but would have been compelled to remain laborers for small wages all their lives. This country allows every boy or girl to rise as high as his or her ability and industry will permit.

You have learned something of what the American has done in the past in the History of Our Land. In other parts of our book we tell you of the famous writers, inventors, painters and sculptors, and so shall not stop to speak of them here. But no mention of America is complete without speaking of the American's belief in education. No other country spends so much money on its schools. In every state of the Union are public schools open free for every child, and many states offer a high school besides. Some states, and even a few cities, support free colleges and universities for their young men and young women.

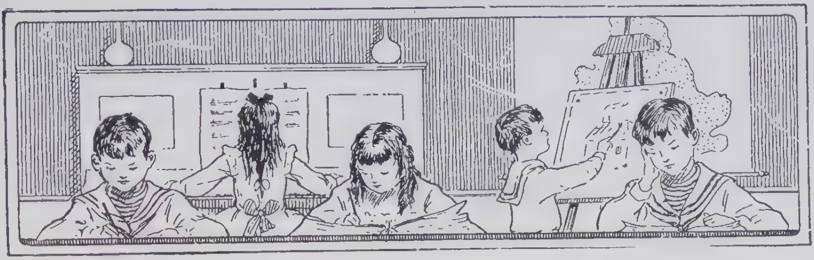
Where the colleges and universities are not supported by the state, rich men have given many millions of dollars for buildings and to pay the salaries of the professors. These wonderful gifts astonish the European, for nowhere else have men of wealth been so liberal. They have also given large sums to establish public libraries, build art galleries and museums, and to found institutions to study scientific and social subjects.

THINGS IN WHICH OUR COUNTRY IS NOT FIRST

As I look back over this article, I fear that it sounds boastful. Perhaps it is, for I have preferred to tell you of the things in which our country has been most successful. But there are other things in which we are not at the head of the world. In music, art and literature we are not yet in the first rank. In obedience to the law and respect for the rights of others, many nations surpass us. Our politics are not always clean. We can only hope that as the years go on we shall improve, and every one of us should do his part to make our country a better place in which to live.

Some one has called America "the melting-pot of the world." By this he meant that in our country people of different races, different languages, different religions, and different ideas of life, are living here together, and out of all the confusion will some day come the future American. Just what he will be like no one can say. He is certain to be unlike the American of the earlier days.

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 3219.



READING

THE WORDS THAT DESCRIBE THINGS

CONTINUED FROM 2376

SO far in these lessons we have only had words that are the names of persons or things: words like CAT, DOG, LION, SPIDER, SHEPHERD, BABY, and many more besides. But this is not the only kind of word that is used in our language. Supposing you were to see a little negro baby, what would you say?

Oh,
what a
BLACK
baby!

And if you could by any chance see Goliath walking down the street (only you never will, of course), you would call out:

Oh,
what a
TALL
man!

When Jack Horner was sitting in that corner of his, greedily eating his pie, he said (but it was not true):

What a
GOOD
boy
am I!

He was not good at all; he was really very selfish.

Now, these three words, BLACK, TALL, GOOD, are not names of persons or things, but they tell us something about persons and things. If we want to be very clever and learned, we shall call these words Adjectives; and we shall call the words that are names of persons and things Nouns. A noun simply means a name, and an adjective means some word added to a name. Try to answer these questions, and the answer will in all these cases be an adjective.

What was the dog that laughed when the cow jumped over the moon?

LITTLE

What was the Simon called who met the pie-man?

SIMPLE

How many little negro boys were there at first?

TEN

But there is still something more to learn about the words we call adjectives.

Supposing you have a little baby brother who is just beginning to toddle about the nursery. As you hold his hand and help him along, you look down at him and he looks up at you. So, if you were thinking about his height and your height, you would say:

I am TALLER than baby.

But supposing you had *two* little brothers, and you were all three standing in a row, each trying to make himself look as big as possible; then, if mother were measuring the height of each one of you, she would say (we will call your name Harry):

"Harry is the TALLEST of the three."

So we see that we can alter the word TALL, and sometimes make it into TALLER, and sometimes into TALLEST.

Again, if we had two apples, one large and the other SMALL, a greedy boy would at once put out his hand and snatch the big one, saying to himself:

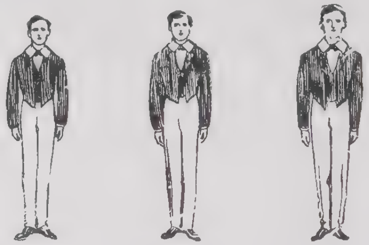
"The other apple is SMALLER than this one."

But if I had seen him do that, I should have made him put it back. Then I should have pulled out a lot of apples from my pocket, and said:

"You shall have the SMALLEST of them all." So we have:

TALL	TALLER	TALLEST
SMALL	SMALLER	SMALLEST

We use the words in the middle column when we have only *two* things or persons, and measure one by the other; and we use the words in the last column when we compare one person or thing with *two or more.*



TALL TALLER TALLEST

This is what is called the comparison of adjectives.

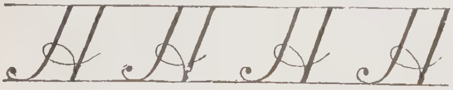
WRITING

FIVE NEW CAPITAL LETTERS

"WELL, Nora, do you remember P, B, and R?" asked her mother, when they had their next writing lesson.

"Oh, yes; and Tom makes them so nicely, mother. Look," replied Nora, as she showed her mother some letters which they had been making.

"Very good, Tom," said his mother encouragingly. "Now you are ready for some new letters. The first one is H; watch me as I make it."



"You see it has two long down-strokes. The first curves round to the left and ends in a curl, and the second makes a loop over to the first down-stroke, and ends in a curve to the right."

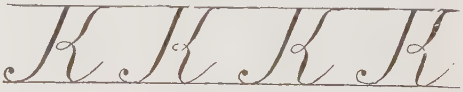
"Two posts like the swing in the garden," said Tom.

"But no ropes hanging down or seat," said Nora. "The rope is only looped round the posts at the sides."

"Be careful to keep the two posts the same distance apart," warned their mother; "and, Tom, the loop should be larger than the one you are making."

Tom tried again, and then he and Nora were shown a letter very like H.

"This is K," said their mother, as she finished making the first one. "How is it like H, do you think?"



Tom thought the first part was like the left post of H, and told his mother, with a twinkle in his eye, that it had a loop like R, and finished like it.

"See, mother," he said, as he turned over his papers of letters to find R.

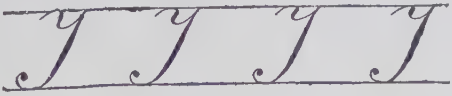
"It is in two pieces like H," said Nora.

"You are both right," their mother

replied. "But notice how the second stroke of K curves inwards towards the other, before it makes the loop."

Tom thought this loop would do for the seat of the swing, but Nora thought it was still too high up.

"H and K are much alike, and the next two letters are also much like each other, and easy to make," said their mother, as she wrote the first for them to copy. "This is T."

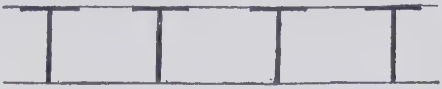


"That looks so easy," said Nora. "What a funny way to begin! The pencil seems as though it wanted to take a walk before starting in earnest."

"And that little walk," added her mother, "makes it different from another letter, so we must remember T has a turn to start with, then a down-stroke like the first part of H and K, and ends in a curl a little to the left.

"T's turn," said Tom to himself, as he copied his mother's letter; "that will help in remembering it." He was just finishing his line of T's, when he thought of the T-square, and said, "Mother, what about the T-square?"

His mother remembered the talk about the T-square and big T, and she showed him how to make the capital T like a T-square with a straight down-stroke and another stroke across it at the top, like this:

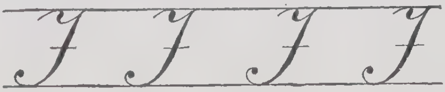


"Many people make capital T like that, so it is necessary you should know how to make both kinds of T."

Nora had seen a signpost with two arms pointing in different directions, where two roads met, and she said that T reminded her of it.

"Does any other letter make a turn first, mother?" she asked.

"Only one," she replied, as she took a pencil to write the next letter, F:



"Like T cut in halves!" exclaimed Nora. "For the only difference is that little stroke across the middle."

F was no trouble at all to make, for, as Tom said, all you had to do was to make T, and cross it like little t.

ARITHMETIC

THE WAY TO MULTIPLY NUMBERS

LET us see now how we are to make use of the multiplication tables which we learned in our last lesson. Suppose we have a question of this sort: "Jack had 32 marbles, and he bought 32 more. How many will he have altogether?" We can, of course, find the answer by adding together 32 and 32, and the work would look like this:

32
32
—
64

But, with the help of the table which we made in the last lesson, we do the work in a different way. We wish to find what *two* times 32 makes; so we write 32, and under the unit's figure we write 2.

32
2
—
64

Then say, twice 2 are 4. Put down 4 (in the unit's place). Twice 3 are 6. Put down 6 (in the "ten's" place).

In many examples we have to "carry" a number, exactly as we do in addition. In fact, we should always remember that "multiplication" is only a convenient way of doing addition when all the numbers to be added together are the same.

If there are 67 houses on each side of a street, how many are there on the two sides together?

We have to find out how much twice 67 makes.

67
2
—
134

In the same way as before write 2 under the unit's figure of 67. Then say, twice 7 are 14. Put down 4, carry 1. Twice 6 are 12, and 1, 13. Put down 13.

So there are 134 houses—that is, one hundred and thirty-four.

Since the numbers 32 and 67 consist of only 2 figures each, we have almost as much to write when we work these examples by the help of our tables as we do if we simply add together 32 and 32, or 67 and 67. But, if the numbers are large, then the new way of working gives us much less to write than the old; while, if we have to use the "3 times" table, we have much less to write, whether the number is large or small.

There are 365 days in a year. How many days are there in three years?

```
 365
   3
----
1095
```

Put the 3 under the unit's figure of 365. Say, 3 times 5 are 15. Put down 5, carry 1. 3 times 6 are 18, and 1, 19. Put down 9, carry 1. 3 times 3 are 9, and 1, 10. Put down 10.

If we could not use our tables, our working would be like this, which is much longer than the way we have just done:

```
 365
 365
 365
----
1095
```

We are ready now to make the rest of our tables, up to "12 times 12." We must first write down the three columns of figures which we had at the end of our last lesson.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

You will remember that the second column contained the numbers which we found in our "2 times" table. To get the third column we added the figures in the first two columns: 1 and 2 made 3, 2 and 4 made 6, and so on. This gave us our "3 times" table.

To get the "4 times" table we must add the figures in the first column to the figures in the third column: 1 and 3 make 4, 2 and 6 make 8, 3 and 9 make 12, and so on. The fourth column will then consist of the numbers 4, 8, 12, 16, 20, etc. These must be the numbers we want for our "4 times" table, because we have added the figures 1, 2, 3, 4, etc., to "3 times" those same figures. Clearly, this must give us "4 times" the figures 1, 2, 3, 4, etc. In learning the table we say to ourselves: "4 times 1 are 4, 4 times 2 are 8, 4 times 3 are 12," and so on.

The "5 times" table is obtained in the same sort of way. Add the figures in the first column to the figures in the fourth column, and we get 5, 10, 15, 20, etc., for our "5 times" table.

Then by adding the first column to the fifth we get "6 times." Going on in this way, always adding the first column to the column we have just found, we get the next table, until we reach "12 times."

We must learn these tables perfectly, so that we can say them right through without a single mistake.

MUSIC

THE GOBLINS ON LEFT SIDE OF THE FAIRIES

OUR piano fairies have many thoughts. They love to think of the dusky twilight; the rugged rocks are a joy to them; the shimmering gold of the sunshine fills their little hearts with song. Sometimes it makes them feel a little lonely, a little sad, to think they have left the home where fairies first were known. On these days they droop their wee heads, and immediately the little goblin in the small black house on their *left*-hand side knows there is something the matter; and to know that a fairy is in distress is quite too sad a thought for any little goblin.

To-day Fairy G's head is drooping, and the goblin immediately on her left-hand side asks:

"Why are you looking so sad?"

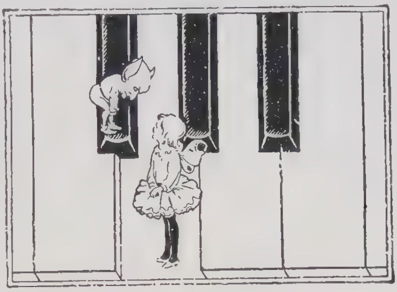
And she replies that the Spirit of the Twilight is needing her, the rocks of Fairy Glen are calling her, the golden rays of the sun are making a ladder for her, if only she will be up and away.

"But what can be done when so many people call on me?" she says sadly. "If I go, there will be no one to sing for them!"

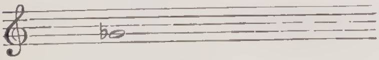
The little goblin is quite excited, because he knows very well that he can make it possible for her to dance in the twilight, to play on the rocks, and to run up the ladder of golden sunbeams. "Never mind, little Fairy G," we hear him say; "if you look among the many treasures your fairy godmother left you when she carried you into this land called 'earth,' you will see a funny little charm like this ♭. When a goblin carries this little emblem, he is able to sing for the fairy immediately on his right, and bear her name."

Fairy G hugs the good, kind goblin, and, hunting among her treasures, she discovers the little magic charm, which among our fairies is called a *flat*. She hands it to her wee goblin, who, as we have said, is immediately on her left, and says:

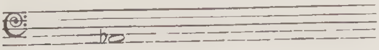
"Dear goblin, I must away. Please sing for me, and everyone shall know you, and call you little G-flat because you wear the magic charm."


Goblin G♭

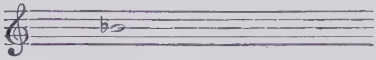
The goblin is very happy; but when you press his little black note you will see that it is a little softer, a little lower, or, as fairies say, a little *flatter*, than Fairy G's voice. The small goblin is feeling just a little sad; it was so great a trouble to him to see a fairy unhappy. On this page there is a picture of little Goblin G-flat hiding behind the magic charm, as he takes up his post on Fairy G's second line in the Treble Road, and if you look at all Fairy G's little homes up or down the piano you will always find on her left-hand side a little goblin to sing for her, only the song will be just a little lower and sadder—a little *flatter*.



All the other fairies have the selfsame need at different times, so you will find a little goblin on the left of Fairy A, and when he produces the magic charm you will call him "little A-flat."



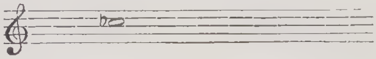
Look at all Fairy A's houses on the piano, and sure enough the helpful, kind goblin will be there. Just so will it be with Fairy B.



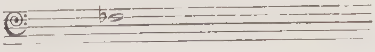
But what about Fairy C and Fairy F? Once again it means a kind little fairy coming to help. Immediately on the left of Fairy C dwells Fairy B, and that means that there is no room for a goblin's house, and poor Fairy C would feel in a great difficulty. But Fairy B cries out:

"Never mind, dear Fairy C, Twilight, Rock, and Sun shall be yours whenever you want, if only you will trust me with the magic charm and lend me your name."

Of course, Fairy C is delighted, and that is how it comes to pass that sometimes Fairy B is seen with the charm, and called little C-flat. Here is a picture of her when she is singing for Fairy C.

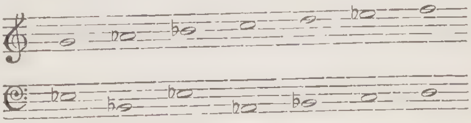


But never forget that the song is softer, lower, flatter. Fairy E is equally kind to poor little Fairy F, for, as you see, no little goblin is to be found on little F's left side. Still, it gives Fairy E the opportunity to be kind and good to her neighbor, and that is one of the beautiful things piano fairies love. Here is Fairy E carrying the magic charm, and therefore bearing the name of Fairy F:



The goblins' magic charm called Flat

This time we will have a game of "hide and seek"; the little fairies will be away, and our work is to discover their little flat goblins, and ask them their names.



COLORS AND HOW TO USE THEM

IF we could only dip our paint-brushes in the rainbow, what lovely colors we should have to paint with! The red, blue, and yellow which we see there are very different from those same colors in our paint-boxes. Red, blue, and yellow lights make white when they are mixed together; but if we mix those colors in paint we get grey or black. Some colors look better together than others; some make each other more brilliant, and some more dull, if they are near each other.

We will try to see this for ourselves. If someone can give us some colored papers—red, blue, yellow, violet, green, and orange—we can cut out squares and disks, and try combinations of color for ourselves. But a better way, if we can manage it, is to paint the shapes on white paper and cut them out.

A pair of compasses, or a tea-cup, will make circles; the squares we have learnt how to make. The circles should measure two inches across—that is, if we use compasses; the distance between the two points—*the radius*—should be one inch. Three other circles should be three inches across, and the three squares four inches. All sides must be alike for a square, you remember.

The three smallest circles we will color red, blue, and yellow. These three colors we cannot make for ourselves by mixing any others together; they are called *the primary colors.*

Use cobalt for the blue, gamboge for the yellow, scarlet lake for the red. If there is no scarlet lake in our boxes we will mix two reds together—crimson lake and light red.

The three larger circles we will color with the same colors, and the squares, too. We must wait till they are all dry, and then we will cut out the three small circles, and put them under a heavy book till we want them. The other circles we are going to change into other colors; and if they are quite dry we can begin by damping them very lightly with a sponge, and then blotting them carefully, one at a time.

Now we will cover the blue disk with yellow to make green, the red disk with blue to make violet or purple, and the yellow one with red to make orange. These are the *secondary* colors; we see them in the rainbow when the primary colors join at the edges.

Now the squares must be turned into violet, green, and orange, in the same way, and left to dry. We can cut out the second circles while we are waiting. When the squares are dry, we change them once more by covering the violet square with orange to make russet or brown; by covering the green square with violet to make olive; and by covering the orange square with green to make citrine.

Now we have what are called *tertiary* colors, and we find them very useful.

When all the squares and circles are cut out, we will try every combination of color we can think of by placing the circles on the squares, or overlapping them. We shall see how some colors make the others brighter. For example, red is made brighter by green, blue by orange, and yellow by violet.

Let us take a long look at the red disk, then quickly at the white ceiling, and we shall see a greenish spot.

If we look at the yellow setting sun we see the sky full of little blue suns; a long look at blue makes us see orange, if we afterwards look at a white surface.

There are little nerves in the eye for seeing the three colors; if we look too long at one, the nerves that see that color are tired, and only those that see the two others can work, and so we see green—made of yellow and blue—when we have looked too long at red; violet—made of blue and red—when we have tired the nerves that see yellow; and orange—made of yellow and red—when our eyes have been tired by blue.

So we learn that too much of one color tires the eyes; we say it dazzles them, and we must put some of the other colors with them to rest the eyes. We can make other experiments with oranges, balls of wool, bright-colored books, and we shall find how different positions make colors change. Wet sand looks blue instead of brown if the sky is blue above it, and the dirty puddles in the road look golden in the setting sun.

The more we learn about color the more lovely things we shall be able to see in the world around us.

LITTLE PICTURE-STORIES IN FRENCH

First line: French. Second line: English words. Third line: As we say it in English.

Aujourd'hui nous irons voir le tombeau de Napoléon avec maman et papa.
To-day we shall go to see the tomb of Napoleon with mamma and papa.
To-day we are going with mamma and papa to see Napoleon's tomb.

Papa appelle un taximêtre. Nous montons tous. Bébé reste chez nous.
Papa calls a taximeter. We mount all. Baby remains at the house of us.
Papa calls a taximeter. We all get in. Baby stays at home.

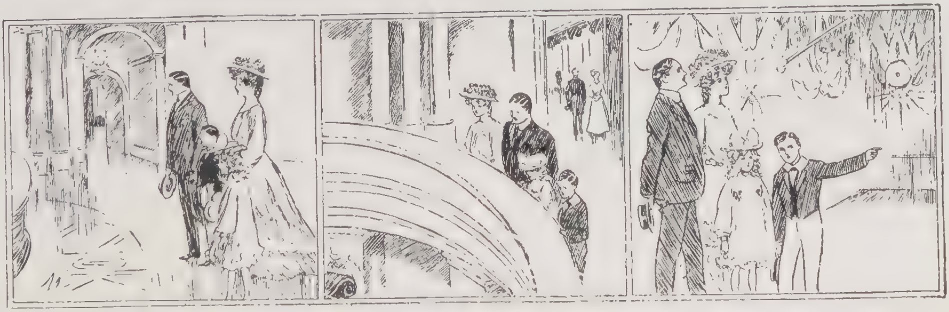
J'aime un automobile, parce que ça va si vite. C'est très agréable.
I like a motor-car, because that goes so quickly. That is very agreeable.
I like a motor-car, because it goes so fast. It is fine.

L'automobile s'arrête, et nous passons par la porte cochère.
The motor-car itself stops, and we pass by the gate for carriages.
The motor-car stops, and we go through the gateway.

Papa dit : " Attendez-nous, s'il vous plait. Nous ne serons pas longtemps."
Papa says : " Await us, if it you pleases. We shall be not long time."
Papa says : " Wait for us, please. We shall not be long."

Nous entrons. Il y a un grand trou dans le plancher, entouré d'un mur.
We enter. It there has a great hole in the floor, surrounded of a wall.
We go in. There is a big hole in the floor, surrounded by a wall.

Nous regardons en bas. Au-dessous est le tombeau dans une grande salle.
We regard in down. At the below is the tomb in a large hall.
We look down. Below is the tomb in a big room.



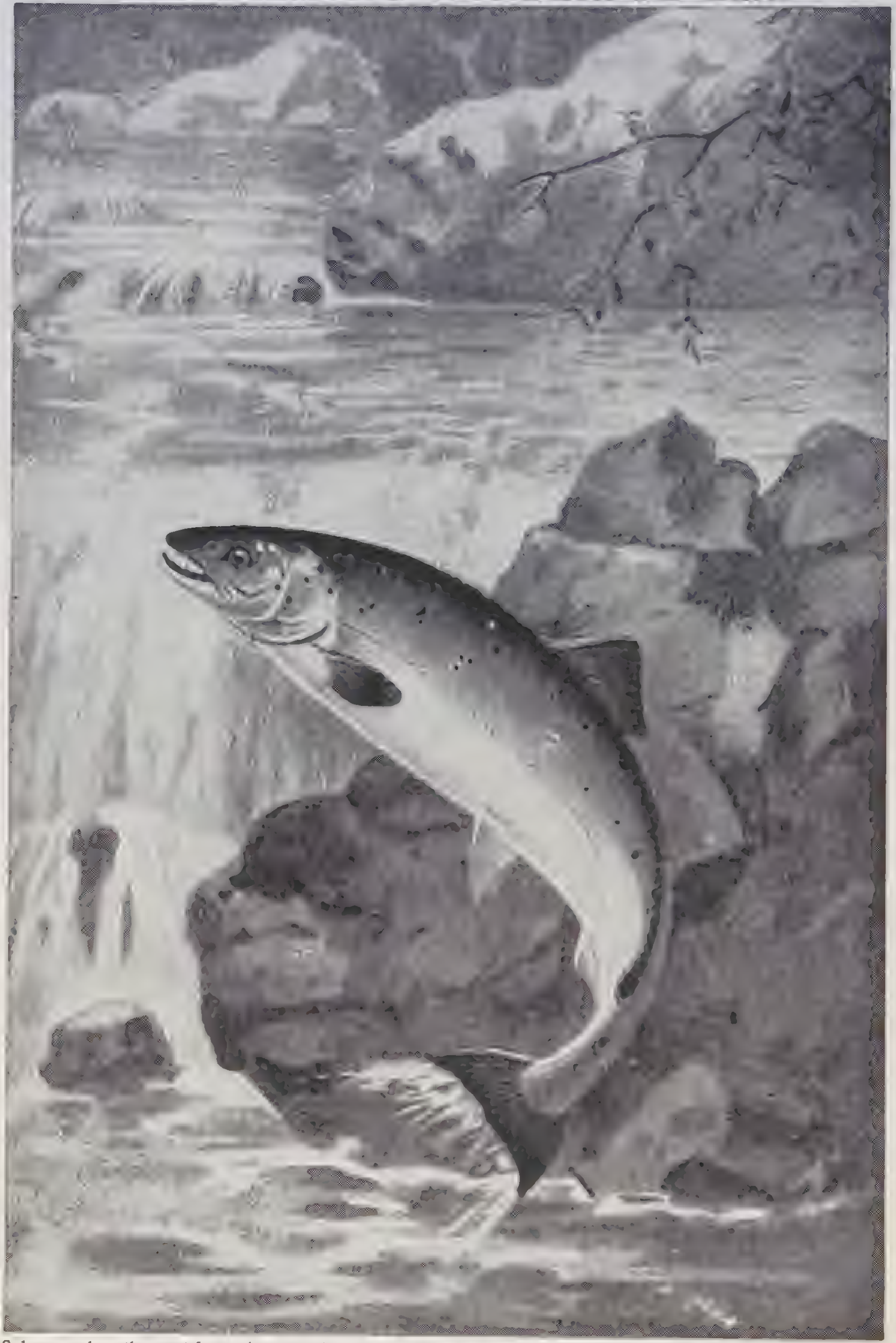
En arrière du tombeau il y a une grande chapelle. Elle est ornée de drapeaux.
In the behind of the tomb it there has a large chapel. It is adorned of flags.
Behind the tomb is a large chapel. It is decorated with flags.

Il y a des épées aussi. Je désire être soldat comme le grand Napoléon.
It there has some swords also. I desire to be soldier like the great Napoleon.
There are some swords too. I want to be a soldier like the great Napoleon.

J'ai un livre sur Napoléon. Je le lirai à Jeannette cet après-midi.
I have a book on Napoleon. I it shall read to Jenny this after mid-day.
I have a book about Napoleon. I shall read it to Jenny this afternoon.

THE NEXT SCHOOL LESSONS BEGIN ON PAGE 2921

THE SALMON'S WONDERFUL LEAP



Salmon, when they get fat and strong, leave the sea for the rivers in which they were born. Often there are rocks and waterfalls in the river, but the salmon, which is very powerful, leaps up the rocks. Sometimes, as we see here, a fish leaps over the rocks at a single bound. At other times it has to make many jumps, and to struggle up from rock to rock. When the falls are too steep, men make ladders to help the salmon.

FISH OF THE RIVERS AND LAKES

CONTINUED FROM 2618

WE have all noted, in reading these stories of Nature, how fortunate we in North America are in having few sharks and other dangerous fish in the waters off our coasts. While feeling thankful that this is the case, the thoughtful student must wonder how it is that we lack the fishes that are dangerous to life, yet have those about us which are good for food. Here an interesting law of Nature comes to help the imagination.

As a general rule, the fishes which belong purely to the ocean cannot live in the fresh water of rivers and lakes. We can all understand this in regard to the deep-sea fishes. They *must* have a heavy pressure of water upon their bodies, or, as we have seen, they will die. Naturally, then, they cannot come into the shallows near the coast, to say nothing of the still more shallow waters of the rivers.

There is a further barrier against other sea fishes; they must have the intense saltness of the seas to which they are accustomed; and so they cannot safely stray beyond the limits of their home. Then there is the question of the warmness of the water. Ocean fish, accustomed to the upper levels of warm seas, would die if they had suddenly to move to cold seas. In this respect, the deep-sea fishes have a big advantage, for, although they cannot rise to the surface, they can travel very far, so long as the water is deep enough. Below a certain level the sea varies little in temperature; hence deep-sea fishes could travel in deep water from Equator to the Poles without feeling any ill effect.

But there are exceptions to every rule, and there is an exception to the rule that fishes of the ocean cannot travel far. Sharks go with the tide up certain rivers. They are to be found in the Lake of Nicaragua, and in the Viti Levu Lake, in Fiji, living always in fresh water. Again we find a species of saw-fish living in a fresh-water lake in the Philippine Islands. We have still more interesting exceptions to the rule in the case of fishes which, born in the rivers, like the salmon, go out to sea to grow; or, like the eels, born in the sea, come up the rivers to get fat and big. Some fishes, on the other hand, are so delicate that if we take them, with ever so much care, from the rivers in which they were born, and place them in other rivers of the same sort of water, they die.

And yet others, like the European fifteen-spined stickleback, we can bring in from the sea, turn loose in the river, and they will be all right. Then we have the lung-fish brought from South America, curled up in his mud-clod, to revive in a tank in a hot-house; while carp can be frozen solid in ice, and taken from one side of the world to the other, to melt out and be as lively as possible.

The king of fresh-water fish is the salmon. Some people call it the king of *all* fish. Certainly it is one of the handsomest and, at the same time, one of the pleasantest as food. Its life is a romance, which many great men have delighted to study, although they were for long puzzled by it. They used to see great salmon swimming up the rivers from the sea, and they used to see them swimming down again, but as there were no tiny salmon with them they could not think that salmon were born in the rivers.

WHERE DO THE LITTLE SALMON COME FROM, SWIMMING OUT TO SEA?

At other times they would see small silvery salmon going down the rivers by themselves, and they would wonder whence these had come. They sought them, but all they could find, when they made their search, were lots and lots of little fish, rather salmon-like in shape, but without silvery scales, and all barred across with black. These certainly were not salmon, they declared, or they would be like their parents.

But one year a keeper, a thoughtful Scotsman, took some of these little black-barred fish and put them in a pond, and kept them there. He watched them carefully until the spring of the following year, and saw the black bars grow less and less distinct, and a growth of silvery scales appear. At last all the bars disappeared, and there, triumphant in their splendor of silver, were the little salmon, all impatient in their desire to go down the river to the sea. Let us now try to follow the life of the salmon, large and small.

SALMON AT SEA LONG FOR THE RIVERS IN WHICH THEY WERE BORN

We will begin in the sea with the big fish, which, we learn, came down the river some months ago. They feed with enormous appetites, eating shrimps, sand-eels, young herrings, and whatever else comes in the way of their splendid sharp teeth. They get very, very fat—so fat, indeed, that when they are caught we can see the flakes of fat, called curd, between their flesh. Well, after all this feeding, they begin to long more and more for the river. They swim into the mouth of the river. Instinct tells them whether it is fit for them to begin their journey or not. If the water in the river is very low, they know that they will not be able to get up, so they wait until rain comes to fill the river; then, out from the sea, into the fresh water they go.

They do not travel in great shoals as the herrings do, but in small parties, one group after another. All goes well at the mouth of the river—the course is wide, the water is deep, and swimming is quite easy. They do not bother about food; they have eaten enough to last them for a long time.

This is really a marvelous provision of Nature. The food which big salmon require is not to be found in the rivers. Now, if the salmon were hungry they would have to turn and swim back to the sea; they could never get up the rivers. But they leave their appetites in the sea, and as they go up the rivers their throats and stomachs contract, so that they do not want to eat.

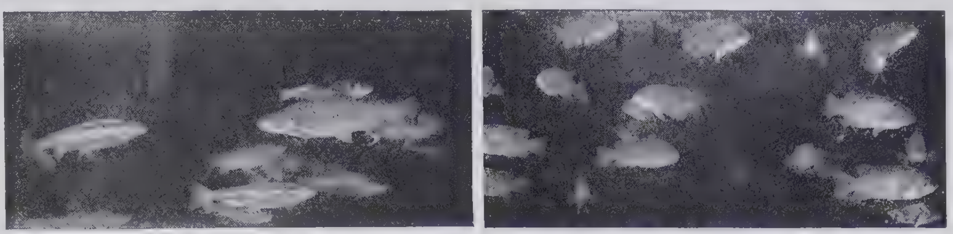
As they get higher up the river they are met by obstructions. There may be a natural barrier—a waterfall, perhaps. Well, salmon cannot be stopped by that.

HOW SALMON LEAP UP WATERFALLS AND CLIMB LADDERS IN THE RIVERS

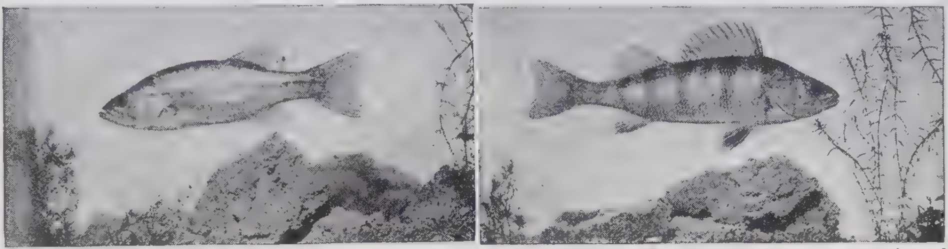
Not even a fish can *swim* up rocks, but the dashing salmon makes his way up by a series of leaps and bounds. If the rise in the river be not more than six or eight feet, he will jump clean out of the water and make the ascent in a single bound. That seems to be about the limit of his powers. He does not believe it, however, and where there is a much higher obstacle he will gallantly go at it, though he may tumble down again and again in the attempt, and finally lie bruised and breathless on the rocks

In many rivers where there are weirs, men make ladders up the rock for the salmon to climb. The ladder need not be broad, so that the rest of the river arrangements is not upset. It consists of a series of steps made of stone or wood, the steps placed, not right across, but about three-parts across the ladder, and arranged alternately. First we have a step branching out from the right; then we have a step branching out from the left. The salmon, after swimming from side to side of the river, and finding no natural way up over the rocks, soon learn that the path lies over this ladder, and up it they go, springing from side

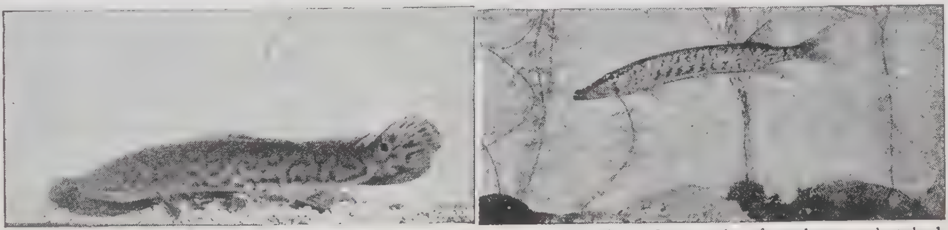
FISH OF AMERICAN RIVERS AND LAKES



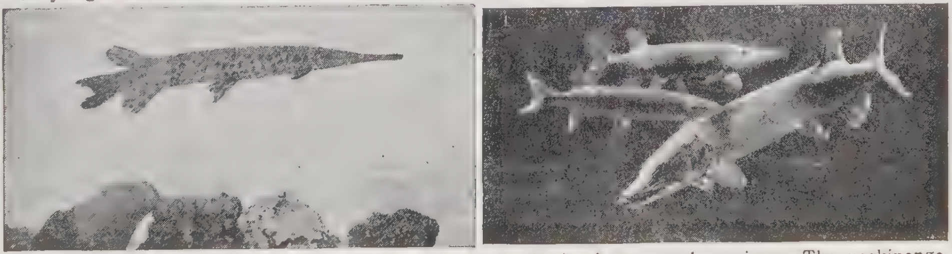
The brook trout is found in the streams and rivers of the East. This little fish is such a good fighter that it affords fine sport for the fisherman. The rock bass is found in every lake, river and stream of the Great Lake region and the Mississippi Valley. It is much more plentiful and easier to catch than the brook trout.



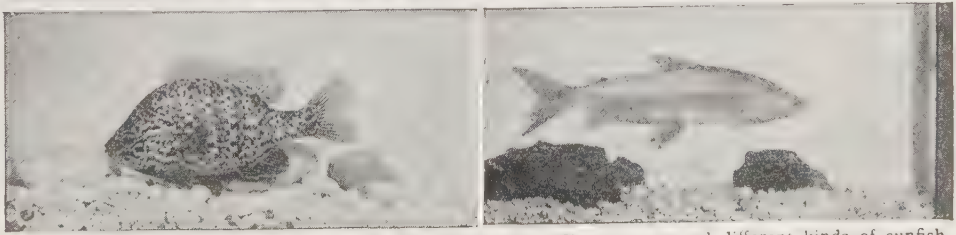
The beautiful black bass, a native American fish, was originally found in the great central plain region of the continent, but has been transplanted to the Eastern and the Western states and to Europe. Our yellow perch, which is smaller than its European cousin shown on page 2707, is usually found in schools. Both these fishes are good for food, and the black bass is the joy of the angler's heart.



The mudfish or bowfin guards its eggs and cares for the young fish for a few weeks after they are hatched. The little pickerel—a member of the pike family—is found in the streams and ponds of the Mississippi Valley region. It is a small fish, but like all pikes is very greedy. It is seldom more than 12 inches long.



The short-nosed gar, which is not good for food, has its habitation in our northern rivers. The maskinonge, or muskallonge, which belongs to the great pike family, is a very greedy fish, but, like most of the pikes, is good for food. It is found in the Great Lakes, and the lakes of Canada, the Ohio Valley, and some of the northwestern states. It sometimes weighs as much as one hundred pounds, and a catch is a pretty sight.



The bright-colored sunfishes are related to the black bass. There are several different kinds of sunfish, and they are found in many parts of the United States. The common whitefish is a relative of the salmon, which lives in all the lakes of the Great Lake region. It goes up the streams and rivers to lay its eggs.

to side, just as the steps are placed. Of course, if there is anything like a gradual rise of rocks, or anything in the nature of what might be called jumping-steps, they will climb the highest waterfalls, just as we might. They are so strong, and spring so well, that, if it is possible for them to make a landing here and there only for a moment, they will master the ascent.

THE SAVAGE-LOOKING SALMON THAT FINALLY REACH THE HEAD OF THE RIVER

Well, in time they do get higher and higher up the river. They do not keep up this dreadful struggle day and night. After stiff climbing and swimming they come to nice sheltered pools in the river, and here they rest during the daytime, traveling for the most part at night. Still, they feel that they are called farther up the river, away to the source of it, even though it rise among the mountains. By this time a change has come over the appearance of the fish. The female has become darker in color; the male has lost his gaudy beauty. He has become a gloomy red in color, blotched with orange and dark spots. His shoulders have become thinner, and his head seems bigger and fiercer. The lower jaw, since he left the sea, has developed a fierce and huge beak, and the male salmon is savage and ugly to look at, and ready to quarrel with his own shadow. The reason is that he expects to have to fight for his mate.

Terrible battles now take place among the male salmon. Many of them are killed outright in the strife, and many more badly injured. In one year 300 salmon were killed in the Tay during these fights. When all the battles have been fought, or even while they are going on, the female makes her nest and lays her eggs.

THE NEST MADE BY THE MOTHER SALMON TO RECEIVE HER EGGS

Yes, she makes a nest, rough though it is. The spot that she chooses is always the gravelly bed of a swiftly flowing stream. The nest is made by the salmon lying on her side and ploughing up a trench by the vigorous wriggling movements of her body. In this trench she lays the eggs, then heaps the gravel over them. She may deposit eggs day after day for about ten days. A salmon lays about 900 or 1,000 eggs for every pound of her own weight. Thus, a salmon weighing 20 lb. will lay close upon 20,000 eggs. We reckon about 25,000 salmon eggs to the gallon, and a salmon weighing 25 lb. is expected to deposit a gallon of eggs in the nest which she makes. When the eggs have all been laid, the salmon, helped by the male, covers them all carefully over with gravel to a depth of some feet.

The purpose of the rough and tiring journey has been attained. The salmon have come up to lay their eggs. They could not lay them in the sea, for the eggs must be laid in fresh water. There they will lie in the gravel for the next ten weeks at least, or it may be even twenty weeks. It all depends upon the weather. The eggs are laid in the autumn, and the little salmon hatch in the depth of winter. Meanwhile, the old ones return to the sea. Men do all in their power to catch them as they ascend the river, but the fish are not molested on their way down to the sea.

THE SALMON'S BABY DAYS AND HIS COAT OF SILVER FOR THE SEA

Now we must follow the little salmon. When born they are ugly little things, with part of the egg attached to them. This part contains the food upon which they will live for the next month or six weeks. The baby fish has a mouth, but it takes no food during this time, relying upon the substance contained in its little pouch. When it begins to feed it is only a modest little creature of 1¼ inches in length. Four months afterwards it is double this length.

Now, for perhaps a couple of years, the young salmon has nothing to do but eat the food which the fresh water furnishes, grow fat and strong, and develop the armor of silvery scales which it is the ambition of every juvenile salmon to possess. When these have at last come, the young salmon become very restive and desire to see the world. So, between March and June, they set out in shoals for the sea. They pass easily over the waterfalls and weirs and other obstacles in their way, but, no matter how fast they go, they seem to note the route so as to be able to find their way back. Not all the youngsters go down together. Some may go down after a year, others may remain at home for three years before setting out. And not *all* that go out return to the river in which they were born. Some wander into other rivers, but the majority go back to their own.

Those that are to return in the first year have not long to stay in the sea. They eat, and eat, and eat as much as they can, and grow at a marvelous rate. They go out as smolts—that is their name in the first seaward-going stage of the youngsters—and then they weigh only a few ounces. They stay three or four months, and return as grilse—that is, young salmon, different from the big salmon only in point of size. But when they come back the fish of a few ounces have grown in three or four months to from 3 lb. to 6lb.

THE SALMON'S MANY ENEMIES AND HOW NATURE PRESERVES THE FAMILY

They have had their fill of rich sea-fare; they long now for the home in which they were born. Little salmon and big salmon set out for the river-head again, and little ones and big ones go for the same purpose, to lay their eggs, so that the stock of salmon in the world shall not fail. It is well that they lose no time, for, though the eggs of salmon are so numerous, their enemies are countless. Big trout eat the eggs which escape from the nests. Birds and fishes eat the young ones in the streams. Big salmon eat the little ones as they go down the stream; sea-gulls and other fish-loving birds plunge into the water after them; and sea-fishes, and, in some countries, seals and sea-lions, lie waiting at the mouths of rivers to eat salmon till they can eat no more.

THE SALMON OF THE WESTERN COASTS

So far we have read the story of the Atlantic salmon, but the story of the salmon of the Pacific is no less interesting, though it has a different ending. When the salmon of the Pacific has laid its eggs, it dies.

There are five different kinds of salmon on the Pacific coast, all closely related to the Atlantic coast salmon. These are the sockeye, the chinook or quinnat, the silver salmon or coho, the dog salmon, and the humpback. All of them come up to fresh water to spawn, but the sockeye, the chinook and the silver salmon are the most important, and it is these beautiful fish that make the Pacific Coast fisheries so valuable. The silver salmon runs up the shorter rivers, the chinook lays its eggs perhaps a thousand miles inland in the waters of the large rivers and at other times probably lives in the sea within a few miles of the coast. Of all these fish, the sockeye is the most interesting. When the spring snows begin to melt, and fill the rivers, the sockeye comes out of the deep from no one knows where. It comes, not in thousands or hundreds of thousands, but in thousands of millions, to face the long, long journey up the rushing streams of the Columbia, the Fraser, the Yukon and other northern rivers. Nothing stops it, nothing daunts it. On and on it goes through swirling rapids, and up cataracts until it reaches its destination in some quiet lake far up in the Rocky Mountains. There, in the shallow waters of the lake margin, the gravelly nest is made, the eggs are laid, and then both male and female salmon die.

The eggs hatch out in from four to six months, and the young fish live in the water in which they were born for about a year. Then they swim down the rivers to the sea and disappear for about two and a half years. At the end of that time they come back, and make for the waters of their native lake, to follow the example of their parents, and lay their eggs and die. From the moment they reappear, they are surrounded by enemies. Millions upon millions of them fall a prey to sea-lions, bears, fish-eagles, but their worst enemy is man, who comes with all the skill his mind can teach him, to catch and kill them.

THE GREAT SALMON FISHERIES OF THE PACIFIC COAST

But though the fish are killed by man, their usefulness is not ended. They provide work and food for many, and the value of the salmon fishing industry of the Pacific Coast is enormous. In Alaska alone 400,000,000 pounds of salmon were taken in 1915 and brought in the sum of $21,000,000, while the value of the British Columbia fishery is nearly half as much. Think of the hordes of fish these figures represent

HOW MEN REAR SALMON AND SET THEM FREE IN OUR RIVERS

Of course such harvests mean that if care were not taken, very soon the salmon would begin to disappear. If every year every salmon possible should be caught before it reached the spawning grounds, before long there would be no salmon at all.

In spite of the enormous numbers of salmon which are hatched naturally, men have, after much careful study of the subject, now become able to hatch salmon eggs artificially. The eggs are gathered and carefully preserved in large tanks in this country, and in Europe in hatching-ponds. When the young ones appear they are kept in great ponds, safe from enemies and well fed, until they have reached a size at which they are able to take care of themselves. Then they are turned loose. In this way we are able to stock rivers which have no salmon.

Included in the famous salmon family we have the salmon trout. These are also called sea-trout. They are not so large as the salmon, though some weighing between 20 lb. and 30 lb. have been caught. Their flesh is pink, like that of the salmon, but not so rich. Their habits are like those of the salmon, for they ascend rivers to lay their eggs; and, as they are smaller than the salmon, and therefore not so strong, we may imagine how great is the courage they show in overcoming the difficulties in the way of barriers which tax even the strength of the great and lusty salmon.

THE TRAVELS OF THE TROUT

The sea-trout and the bull-trout are the only members of this family which go out to sea. The others remain all their lives in fresh water. These are among fish which very often we see leaping out of the water after flies. They are hungry creatures, and eat any number of other fishes' eggs, and even young fish. But the food of which they are fondest consists of fresh-water shrimps and worms and slugs, which heavy rains wash into the rivers and lakes. But they are not particular; one was caught which had a young viper in its mouth. They have the wonderful power of making their color fit their surroundings.

The trout show the same instinct for the preservation of their species as the salmon. Between the beginning of October and the end of November they make their way to the gravely head of streams, and there they lay their eggs as the salmon lay theirs, and carefully make a nest.

COUSINS OF THE SALMON THAT DO NOT GO TO SEA

Not all the cousins of the salmon go to sea. Some trout stay in the fresh water of the lakes, and of these a very useful member of the family is the Mackinaw or Great Lake trout. It is a greedy fish, and it is said that it will even eat a jack-knife. Great numbers of these fish are caught every year, and at one time it seemed as if they might soon be numbered among the disappearing fishes. But the government hatcheries began to hatch them by artificial means, and once again the fishery has become valuable.

The whitefish of the Great Lakes and the northern lakes is also a relative of the salmon which stays in fresh water. This fish goes up the streams and rivers to lay its eggs, and then goes back to the deep water of the lakes to live. The whitefish fishery of the Great Lakes is very important.

A HERRING THAT NEVER SEES THE OCEAN

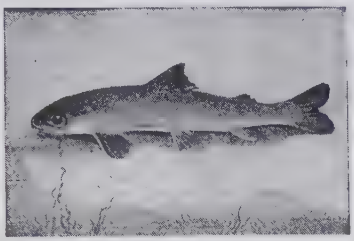
Another lake fish about which we ought to know is the cisco or lake herring, which is not a herring at all, but a cousin of the salmon and the whitefish. It is a beautiful fish with blue-green back and silvery sides, and perhaps is called a herring because it swims about in schools. Large numbers of this fish are caught every year and sent to market.

ANOTHER FISH THAT COMES BACK FROM THE SEA

Fish that leave the sea and swim up the rivers to lay their eggs are said to be andromadous, and the dictionary tells us that this long word means that they pass up from the sea to fresh water. An andromadous fish that is not related to the salmon is the bony shad. This fish comes up the rivers of the Atlantic coast all the way from Florida to Newfoundland. It is so valuable as food that the Fish Commission of the United States had it "planted" in the western rivers, and it is now as well known along the Pacific coast as it is on the eastern side of the continent. Next to the salmon and the cod, the shad fishery is the most important in the United States.

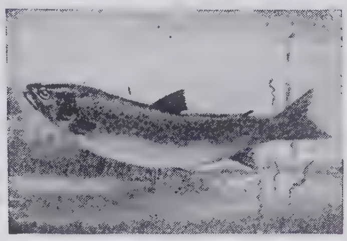
We pass now to a very stay-at-home fish—the pike. This is the fiercest fish in our waters. He will eat anything—rats, ducks, water-hens, young geese,

SOME COMMON FISHES OF THE RIVERS

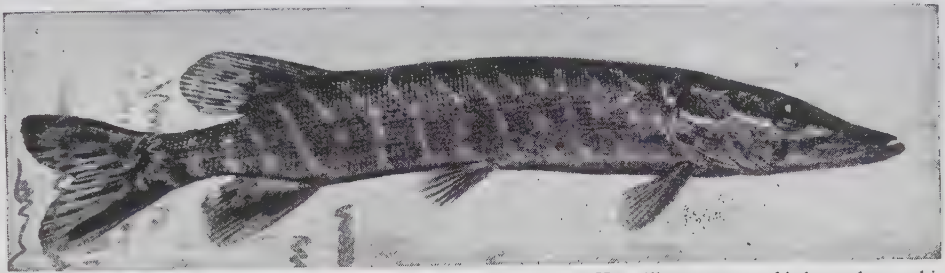


A young salmon undergoes a good many changes ere it is the handsome fish that goes down to the sea to grow big.

Gudgeon are common English fish. They are often used as bait to catch other fish.



Trout flourish in nearly all lakes and streams which have pure water. One was caught in Scotland weighing 29 lb.

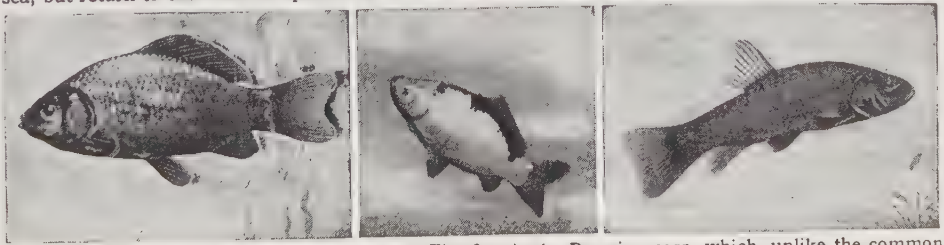


The pike is a savage fish, and is called the fresh-water pirate. He will eat rats or birds, and even his own children. He loves to hide under a bank or under the root of a tree, and to dart out and seize his prey.

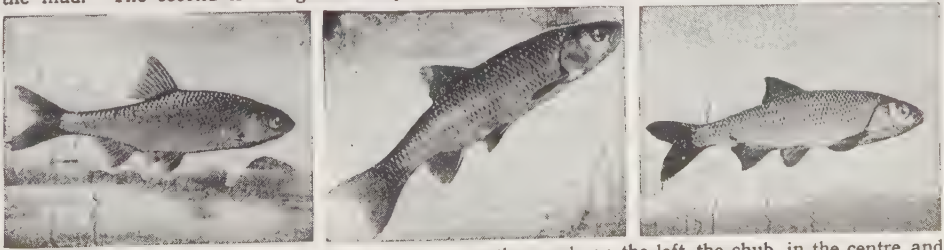
The salmon trout are also called sea-trout. Born in the rivers, they swim to sea, but return to the rivers to spawn.

Minnows are of the carp family; some are very small and are used as bait.

The barbel is a queer fish. He sleeps when frozen solid in ice, and wakes up again none the worse when thawed.



These are three members of the carp family. The first is the Prussian carp, which, unlike the common carp, has no pendants from the lower jaw. The third is the tench, which passes the winter asleep in the mud. The second is the golden carp, or gold-fish, which we keep in fresh-water aquariums.



In these pictures we see three more fishes. These are the roach, on the left, the chub, in the centre, and the dace, on the right. This helps us to remember how numerous is the carp family. Although these are very different in size and form from minnows and gold-fish, they are all members of the same carp family.

fish, frogs, snakes, and even his own family. The only thing to which he says "No" is a big, healthy perch, whose sharp spines are too much even for the mouth of the river-pirate, as fishermen call the pike. If the young pike, or jack, as it is commonly called, can escape the jaws of its relations, it soon grows into a nice-sized fish, and shows itself as hungry as its parents.

The pike, however, is not the only member of its family that lives on this continent.

The delicious pickerel is a pike, and so is the giant maskinonge of the Great Lakes and the lakes of Canada. This fish may weigh as much as 80 lb., and reaches a size of from 4 to 6 feet.

HOW THE CARP CAN GO ROUND THE WORLD IN ICE AND WAKE UP AGAIN

One youngster, only five inches long, was found to have swallowed a gudgeon as big as itself, and was cheerfully swimming about with the gudgeon's tail sticking out of its mouth. The pike makes its home in a hole under a bank in weedy water, there to lie in wait for anything eatable that may come along. If nothing happens to affect it, the pike will go on growing for years and years. The average weight of a good pike is from 12 lb. to 20 lb., but they have been caught weighing 60 lb.!

A fish of the river and lake about whose age we know more is the carp, which was introduced into America from abroad more than forty years ago. Nothing seems to come amiss to it. Its first home was in China, but it flourishes equally well in Germany and Sweden and England. We can freeze the carp into a solid mass of ice, send it on a journey round the world, then revive it by melting the ice, and the carp will wake up and go about its feeding as if nothing had happened. But it does that sort of thing quite naturally.

FISHES STILL LIVING IN A STREAM WHERE MARIE ANTOINETTE MAY HAVE FED THEM

When the weather turns cold, and its pond freezes, the carp go to sleep in the mud under the ice, and bother no more about the world and its troubles until Spring's warm hand melts the ice and summons all living things to renewed activity. Taking life so easily, the carp naturally lives to a great age. In the stream running through the park in which poor Queen Marie Antoinette spent her happy days are great fat carp, crowding the water as they did in her day. It is said that in that stream there are to-day the very fishes which the poor queen fed more than 120 years ago.

The gold-fish which we keep in bowls and ponds are carp. They are wonderfully hardy creatures. They like hot water—that is, if they have plenty of it; but in aquariums the water should be kept cool. Very often they are kept in ponds into which the hot water from steam-engines flows. We always find them at the top, where the water is hottest. They get as fat as butter in water which is 90 degrees—nearly as hot as our blood. But if the pond freezes, all that is done is to crack the ice at the top to let them get air. Perhaps even that may not be necessary. Theirs is a very different constitution from that of great things like conger-eels, which, though accustomed to cold water, cannot sink if they come to the surface when there is a keen frost.

The carp tribe is quite a big one. Barbel, for which those men angle who cannot afford the luxury of salmon and trout fishing, form one branch of the family. Another branch includes the gudgeons, humble little fish which men catch mainly to use as bait for bigger fish, though the larger ones form excellent food for the table. We cannot stay to examine the roach, chub, and dace, well-known European fish.

A FISH THAT LAYS ITS EGGS IN THE SHELL OF A MUSSEL

But we must not neglect the minnows, their small relations. Every boy or girl who has ever put a fishing-net into a pond may have been puzzled to know why these little fish are so differently colored at different times. The fact is that the minnows, when excited by food, become much brighter in hue than when quiet; and at night they are the soberest-looking little fish alive. They multiply rapidly, and are a never-failing source of food for larger fresh-water fish.

The tench is another form of carp, and, like its big cousin, loves to grovel in the mud and to sleep there, buried, during the cold weather. The tench lays many eggs, but not so many as a big carp proper, which lays about 700,000.

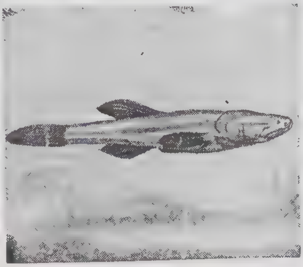
A very curious fish is the little bitterling, which, as its name implies, is very bitter, and we can use it only as bait for

NESTING FISH AND A FISH THAT WALKS

The bitterling lays its eggs in mussel shells, so that they may remain unnoticed and safe from danger.

The European bream, of which this is a picture, belongs to the carp family. Our bream is a sunfish.

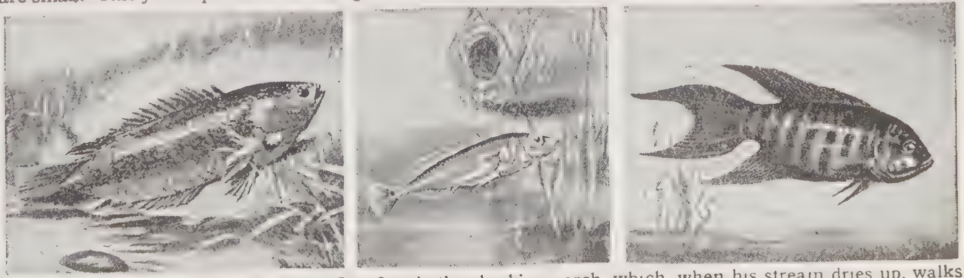
This fish, the bleak, is another carp. It has beautiful scales which are used for making artificial pearls.


The Kentucky blind fish has no eyes, and lives in the waters of the caves where no light enters.

The bull-head eats other fishes' eggs, but defends his own with skill and courage against all enemies.

The perches are a numerous family. Most of them are small. This yellow perch seldom weighs over 2 lb.

The double-eyes have two pairs of eyes. With one pair they look up, with the other watch the water around.


These are three remarkable fishes. The first is the climbing perch, which, when his stream dries up, walks on dry land to find other water. The second is the little stickleback, which makes a nest and fights like a hero for his children. The third is the paradise-fish, which forms a nest of jelly-like bubbles blown from its mouth.

The photographs on these pages are by S. & W. Johnson, W. S. Berridge, Lewis Medland, R. Thiele & Co., H. J. Shepstone, and others

eels and perch. But it is an interesting little fish, for it has the cuckoo's habit of causing other creatures to hatch its eggs. The bitterling, when she wishes to lay her eggs, seeks the fresh-water mussel, and places the eggs within its shell. There they develop and are hatched, and the little bitterlings go off from their strange nursery not exactly knowing whether they are going to grow shells or fins.

Another common European fish is the bream. Anglers are quite happy if they catch one weighing a pound or two; but the giants of the family, living in Irish lakes, attain a weight of twelve or fourteen pounds.

Keeping still to the carp family, we come next to the bleak, a handsome little fish which pike and trout and similar fishes, as well as sea-gulls and terns, much relish as food. Bleak are interesting chiefly because of their beautiful pearly scales. These are so handsome that for ages they have been used in the making of beautiful artificial pearls.

FISHES WITH DOUBLE EYES AND FISHES IN CAVES WITH NO EYES AT ALL

There remain now some of the fish remarkable in regard to their structure or their habits. One is the famous double-eye of tropical America. Its eyes are among the strangest in the world. Each eye is really two eyes. The upper portion is shaped like a lentil, so is called lenticular; the lower eye is oval. The reason for this extraordinary formation is that the fish, when swimming, carries itself near the surface of the water, with the upper part of the eye just out of the water, and the lower half beneath the surface. Thus it can see what is happening in the air above it, and at the same time mark the progress of events in the water.

While these fishes have two pairs of eyes, there is one fish with no eyes at all. We know that there are blind fish at the bottom of the deep seas. No light can reach them, so some of them have no eyes, while others have to depend upon their own phosphorescence or that of other creatures, and have enormous eyes to catch any ray of light from such sources. But in the fresh-water fishes we do expect to find eyes. However, in the famous fishes of the great caves of Kentucky we find the eyes completely missing. In those still, deep waters there is no light. It is a dark subterranean fresh-water sea in which these fish live, and they are as blind as the rocks amid which they swim.

To make up for this they have remarkably acute hearing and sense of touch. They can detect the presence of a human being if he makes but the slightest sound near them, but if he keeps perfectly quiet he can catch them in his hand or net as they swim, pale and blind, to the top of the water. They find their food by their delicate sense of touch, which resides in a series of nerves upon the two top sides of the head.

FISHES THAT LEAVE THE WATER AND CRAWL MANY MILES ON DRY LAND

The perch, which is common in our rivers, is remarkable to us for two features—the enormously strong spines with which its back is armed, and the number of eggs it lays. A little perch, weighing only half a pound, has been known to lay more than a quarter of a million eggs. But the strangest perch of all the family is the climbing perch. This wonderful creature lives in India and Ceylon, where streams and ponds are apt to run dry. It waits as long as it can before moving to fresh quarters. The water gets lower and lower, and the fish may be seen melancholy in the mud.

At last the fishes can delay no longer. They climb the banks and set out for some place where, by a mysterious instinct, they know water is to be found. Their lower fins and strong backbone enable them to crawl along the dry land, and, of course, they breathe the air. In order that they may not die, as most fish would, they have a special arrangement inside the mouth which enables them to retain a large amount of water with which to keep their gills moist.

THE TRAVELS OF THE CLIMBING PERCH IN THE BLAZING NOONDAY SUN

So long as they can keep their gills damp they can live, and they scurry along to some other stream or pond, and topple in, thankful to get back to their native element. It is said that they climb trees, either to drink the water collected in big hollow leaves, or to catch the insects which may be found reposing there.

The spines of the perch are formidable, as the pike well knows, but they are less terrible than those with which the little stickleback is armed. The stickleback is one of the commonest fish we have in our waters, but his life is as interesting as any. The little male stickleback is one of the best and most faithful of fathers.

THE WONDERFUL NEST THAT THE CLEVER LITTLE STICKLEBACK BUILDS

He makes a wonderful nest for the reception of the eggs. He gathers pieces of delicate fibre and weaves them together with his mouth, then places them in a little trough or other recess which he finds or makes for himself. He tries each piece of material to see that it is heavy enough to sink and cannot float away. If it is not quite as he wants it, he brings a little sand and drops that upon the material to weight it down. When all is ready he coats the fabric of the nest with a sort of cement which he produces himself, and makes a hole through it to allow his mate to pass in at one side and out at the other.

Then the female stickleback appears and lays her eggs in the nest. For the next three weeks the male stickleback guards the nest day and night. Big fish come up and try to get the eggs, but the brave little sentinel rushes at them with such force that, if they do not retire, his terrible spines may rip them open. Fish many times his own size he will put to flight in this way. This does not complete his cares. The eggs must be frequently moved so that they may all benefit by a full supply of fresh water. The intelligent little creature fans the water with his fins so as to force a current right through the nest, and he will also seize the nest in his mouth and rearrange the eggs within it, so that there shall be no possible chance of the eggs not being all treated alike by the pure water.

A FISH-FATHER WHO FIGHTS FIERCELY TO PROTECT HIS FAMILY

In three weeks' time the little fish hatch, and then his troubles are increased. The tiny things have no sense of danger, but swim about where hungry fish can catch them. He knows all about their peril, and, rushing after them, beats off the fish which would attack them, then carries the truants back, one by one, in his mouth to their nest or to the bottom of the water, where he can keep them together and safely guard them. When the young ones grow up, the father relaxes his care and soon dies.

The paradise-fish of China is another famous nest-builder. But here the nest is made entirely from materials supplied by the male fish. He blows bubbles of mucus from his mouth, and forms a nest under the water like that which the little insect called cuckoo-spit forms on our flowers. In that he places the eggs which the female fish lays, and there are born the little fish which it becomes his business to guard.

THE BLACK BASS THAT FISHERMEN LOVE

The black bass is another fish that prepares a nest for its eggs. This is done by the male fish, which scoops a round hole for the eggs and watches them until they are hatched. This beautiful fish may weigh as much as four pounds, and, wherever fishermen gather, tales are told of struggles to land some dark green-gold beauty, and its efforts to escape. The black bass was once found only in America, but has been introduced into Europe.

A FISH THAT CREEPS INTO HOLLOW LOGS

Some people have a foolish objection to eating catfish, perhaps because of its name, or because it has a number of sharp barbels or spines about its mouth, which give it an ugly look. Nevertheless, most of the catfish are very good to eat.

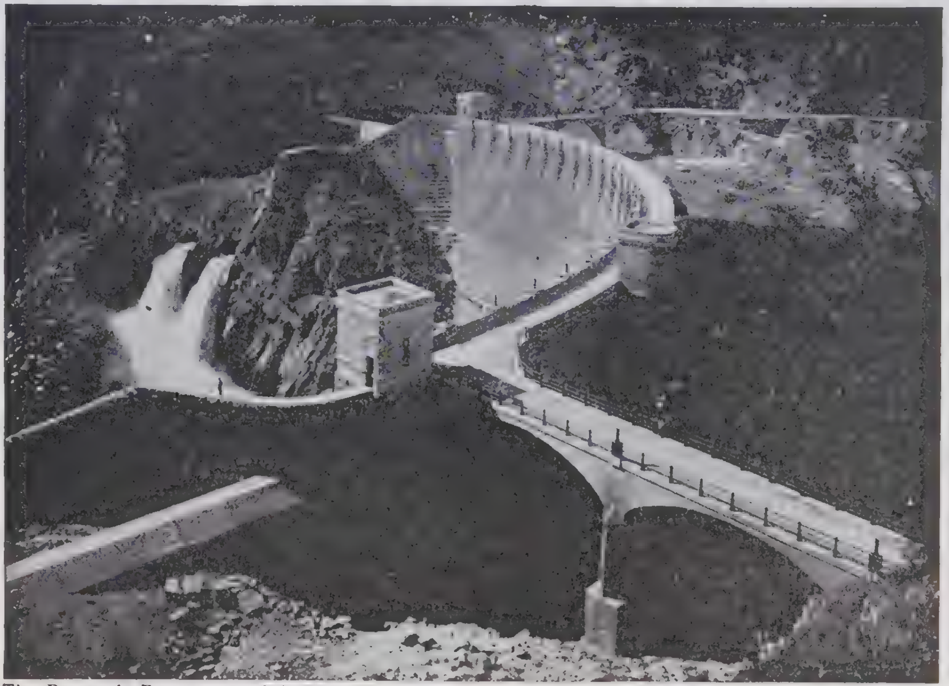
One member of this family, the goujon, likes to creep into hollow logs, and sometimes cannot get out, so that occasionally a goujon or mud cat is found after a log has gone to the sawmill.

HANDSOME FISH THAT "SIT" ON THEIR EGGS AND HATCH THEM

We have in the little bull-head of our clear northern streams a fish that eats other fishes' eggs. The eggs of the bull-head are placed in a hole which the male fish makes. He guards the eggs as carefully as the stickleback guards *his*. But there are fishes which actually sit upon eggs, even as birds do. These are members of the gay family of chromids, found in Africa and tropical America. The males make nests for the eggs, and rest in the nests upon the eggs until the latter are hatched. Among fishes there are many cannibals which eat their children, but there is some compensation for this in the examples of care, attention, and affection that we have been studying.

THE NEXT STORY OF NATURE IS ON 2849.

TWO GREAT DAMS IN THE WEST



The Roosevelt Dam, across Salt River in Arizona, is one of the most important irrigation works constructed by the United States. The dam is 1,000 feet long and 280 feet high. The curved side is up-stream to meet the current of the water. This shows the reservoir only partly full, and the water escaping through tunnels in the rock. Irrigation works like this bring many acres of fertile land into cultivation.

The Arrowrock Dam, on the Boise River, near Boise, Idaho, is more than 348 feet from the foundation to the top, and is, therefore, the highest dam in the world. It is more than a fifth of a mile long and the backwater extends twenty miles up-stream, forming a beautiful mountain lake. The stored water is carried down-stream twelve miles before it is diverted to the land to make the crops in the fields flourish.

WHAT THIS STORY TELLS US

IT is said that the people of the United States take out more patents than those of any other country. In no other country is so much machinery of so many kinds used, and nowhere else are so many things which save labor used in the house or in the office. There are several reasons for this. The people of the United States have always been ready to try new things. They have not thought that they must do a thing simply because their grandparents did. Another reason for the use of so much machinery is the high wages paid in this country. When labor costs a great deal employers will be glad to get machines to do the work of muscles, whenever possible. A third reason is the fact that the people of the United States are better able to buy new inventions than those of any other large nation.

AMERICAN INVENTORS AND INVENTIONS

CONTINUED FROM 2627

WAGES are higher in the United States than anywhere else in the world. This has been true from very early times, and the fact has had great influence upon the growth of the country. The reasons for the high wages we cannot stop to discuss here, but they have brought many immigrants to the United States.

WHAT MUST ALWAYS FOLLOW HIGH WAGES

Where wages are high, employers will try to get their work done with as few workmen as they can, and this is one of the reasons why the United States is ahead of the world in labor-saving machinery. Though the machines may cost a large amount of money, they often pay for themselves in a few years, long before they are worn out. In fact manufacturers often throw away a good machine when a better is invented.

In Europe wages are lower than they are in the United States, and therefore we find many things done by hand in all the countries of Europe which here are done by machines. In India wages are still lower and there we find very little machinery. You can see why this is true. An employer who can use much hand labor does not need to put much money into expensive machinery, and does not need to construct buildings at high cost.

Americans began to invent very early, though as there was no Patent Office in this country then, we do not know exactly what was done. Because of the rough roads, the British wagon which the colonists had brought with them was changed in several ways. Thomas Jefferson improved the plough then in use. The axe is another tool which was somewhat changed in shape by the colonists.

One of the first of our inventors was Benjamin Franklin, about whom you can read in another place. Born a poor boy in Boston in 1706, he became the companion of princes and the friend of the greatest men of his time. When still a young man he improved the printing press, and though these Franklin presses would now be considered so slow that no one would think of using them, they were better than anything before them.

Of his discoveries in electricity you are told on page 2164. The lightning rods you now see on barns or houses in the country are his invention, made in 1752. Another was a stove in 1742, intended to save a part of the heat, which went up the chimney from the open fireplaces. Many thousands of them are still in use.

THE COTTON GIN AND THE SUCCESSFUL STEAMBOAT

You have also been told of the invention of the cotton gin by Eli Whitney in 1793. This machine is one of

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the most important inventions ever made, and is one of the few machines which have been very little improved since first shown to the public. It made cotton growing profitable, and slavery, which seemed to be dying out, became so firmly fixed in the cotton-growing states that only a great war and the sacrifice of hundreds of thousands of lives could drive it out.

In another place you have been told of Robert Fulton and his steamboat, the Clermont. Fulton was not the first person to build a steamboat, as you know, but he was the first person to run one successfully, and the trip from New York to Albany, in 1807, marked the beginning of the steamships of the present day. You can see that a sailing ship could not always be used on a river if the wind blew the wrong way. A steamship can be used at all times.

INVENTIONS SELDOM THE WORK OF ONE MAN

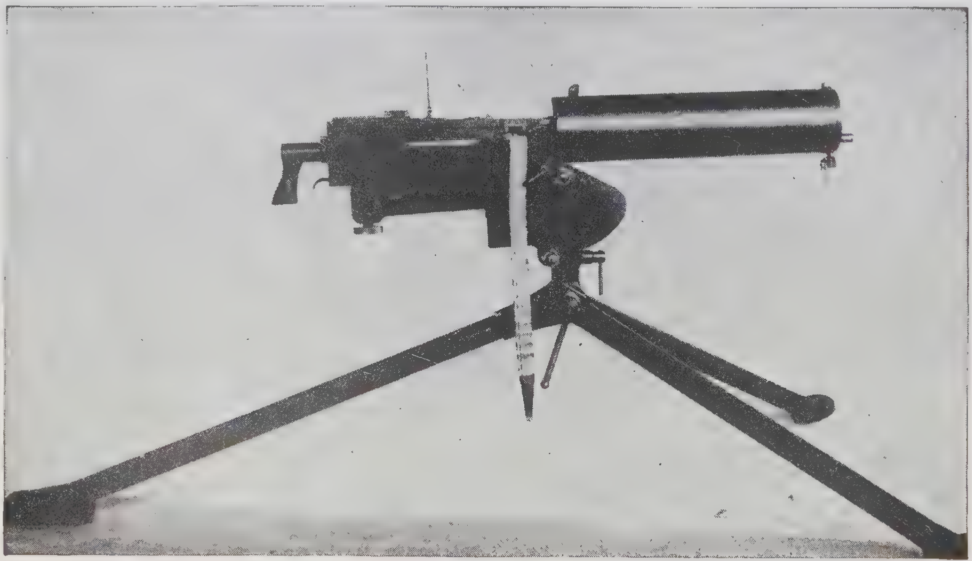
It seldom happens that an invention is the work of one man. The first man gets an idea but he cannot quite make it work. Another makes an improvement, and then another, and finally some man, using the work of those who have gone before, reaches success.

Inventors do not always get the benefit of their inventions. They are seldom good business men, and are often very poor, sometimes because they are so much interested in their ideas, that they will not work at their trades. It often happens, therefore, that they sell their inventions for a small part of their value. Some men have died in poverty, while others have made great fortunes from their ideas. We shall speak of some of these as we go along.

IMPROVEMENTS IN FIREARMS AND OTHER WEAPONS

Now American rifles, shot-guns and revolvers are among the best in the world, but no one man is responsible. As early as 1811, a man named G. H. Hall made a gun which could be loaded at the breech, as the end of the barrel next to the wood is called. Some of them were made for the United States army in 1818. Many men had tried to do something like this before but had not been successful. Now soldiers are armed with breech-loading guns, which often carry several extra cartridges also.

In 1830, Samuel Colt invented a new form of pistol which could be fired several times. In 1835 he improved this by making the part containing the cartridges revolve, and so the weapon was called a revolver. This pistol could be fired many times while the old-fashioned pistol was being loaded once. Mr. Colt began to



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In a test this heavy Browning Machine Gun, weighing only 34 pounds, fired 39,000 shots without stopping. The end of the barrel shows at the right, and the cylinder around it is filled with water to prevent the barrel from becoming red hot. The cartridges are in belts of 250, and one belt can be fastened to another.

manufacture them at Hartford, Connecticut, and his factory grew to be one of the largest of its kind in the world. In this case a large fortune was gained by the inventor himself.

We hear much of machine guns these days. They are guns which can be fired two or three hundred times a minute. Many men had worked on the idea, but Dr. Richard Gatling was the first person to succeed. He completed his gun in 1861, and some of them were used during the Civil War. This gun had ten barrels. Many improvements have been made since, and now some machine guns are not much heavier than rifles.

The gun now used in the United States army is the Browning, named for its inventor, John M. Browning. The army officers declare that it is the best in the world. The barrel of the heavy gun, a picture of which is shown, is surrounded by a water jacket to prevent it from getting red hot. The cartridges are placed in belts, each containing two hundred and fifty, and one belt can be fastened to another. In a test 39,000 shots were fired without stopping. There is a lighter Browning gun which can be carried by one man. The latter is really a kind of repeating rifle.

THE PROFESSOR WHO INVENTED THE TELEGRAPH

You have been told something of the invention of the telegraph by Professor S. F. B. Morse. He was born in Charlestown, Massachusetts, in 1791. His father, Reverend Jedediah Morse, was one of the first American authors of text-books, and sent his son to Yale, where he had himself graduated. After young Morse graduated he went to Europe to study art and remained several years. He came to New York in 1815, and was successful as a painter. After another stay in Europe he became professor in the University of the City of New York. One of the other professors was lecturing on electricity, then not very well understood, and in 1832 Professor Morse got the idea of the telegraph, and in 1835 succeeded in his experiment in one of the buildings of the University.

Some improvements were made and in 1838 he asked the United States Congress to build a line from Washington to Baltimore to see how it would work over long distances. Most people laughed at the idea and Congress did not vote the money. He then went to Europe to try to get some foreign government to give him the money, but was unsuccessful there also. He continued working on his invention and trying to get money to build a line, but without success. Finally, when he was just about to give up, Congress, on the last day of the session, March 3, 1843, voted $30,000. With this the line was built, and on May 24, 1844, the message, "What hath God wrought!" was sent from the Capitol at Washington to Baltimore.

Though his claim to the invention was disputed, Professor Morse was successful in defending his rights. He received much money from the invention and many honors were awarded him by European governments. Our own government, as you know, does not reward inventors in this way.

Samuel Finley Breese Morse.

HOW GRAIN WAS CUT IN THE EARLY PART OF THE CENTURY

In the early days of our country grain was cut with a sickle, a picture of which you may have seen. It was in shape much like the "question mark," which is put at the end of some sentences. A man seized a handful of the grain in one hand and cut it off with the sickle. Next a "cradle" was used. This was a long curved knife at the end of a handle, with wooden fingers which kept the grain from falling. Some of them are still used on small farms or upon rough ground.

Obed Hussey and Cyrus Hall McCormick were working on a new machine to cut grain at the same time, and both received patents: one in 1833, and the other in 1834. The more successful was the McCormick machine. This machine, which was drawn by horses, cut more than many men could do by hand. At once others began to try to improve this machine, and just before the Civil War, John E. Heath invented a machine which not only cut the grain but tied it into bundles, thus saving much more labor. Now to some of these machines a threshing machine is added, which separates the grain from the chaff, as it is drawn along. We show a picture of one of these machines on page 1130.

OTHER IMPROVEMENTS IN FARMING MACHINERY

There have been many other improvements in agricultural machinery. You remember the picture of the plough used in the Philippines, which is hardly more than a crooked stick. Only a little more than a hundred years ago, such ploughs were common in this country, though the point was covered with iron. Thomas Jefferson invented an improved form of plough. In 1797, Charles Newbold, of New Jersey, invented an iron plough, but the farmers would not use it as they feared that the iron would poison the soil. Besides it was very heavy and expensive.

Jethro Wood, in 1819, invented an iron plough made in several parts so that if one broke it could be replaced without trouble, and this came into common use. Then the plough was put on wheels, and instead of holding the handles, the farmer has a comfortable seat and drives the horses. On the great farms in the West, many ploughs are pulled along at the same time by one engine called a tractor.

These tractors are used for many purposes. They draw agricultural machinery; they pull heavy wagons along the roads and through the fields; they pull up stumps. They also furnish power to run threshing machines, corn shellers and the like, and to do many other kinds of work around the farms.

Only a few years ago all hay was raked by hand. Now a horse-rake does as much as twenty or thirty persons could do, and when the hay is partly dry, a tedder scatters it, so that the sun can reach every blade. We have also machines which sow the seed and then cover it up. There are machines to gather corn, to husk it, and separate it from the cob. If corn had to be separated from the cob by hand, it is said that it would take all the people in the United States one hundred days a year to do this work.

SOME INTERESTING FIGURES ABOUT FARMING

Some one has calculated that now it takes on the average only ten minutes of labor to grow a bushel of wheat, while seventy-five years ago it took three hours. It takes forty-one minutes of labor to grow a bushel of corn while then it took four and a half hours. A hundred years ago about three-fourths of the people lived on farms. Now something less than one-third are able to raise food enough for the whole population and have some to spare for other nations. The chief cause of this is the invention of farm machinery.

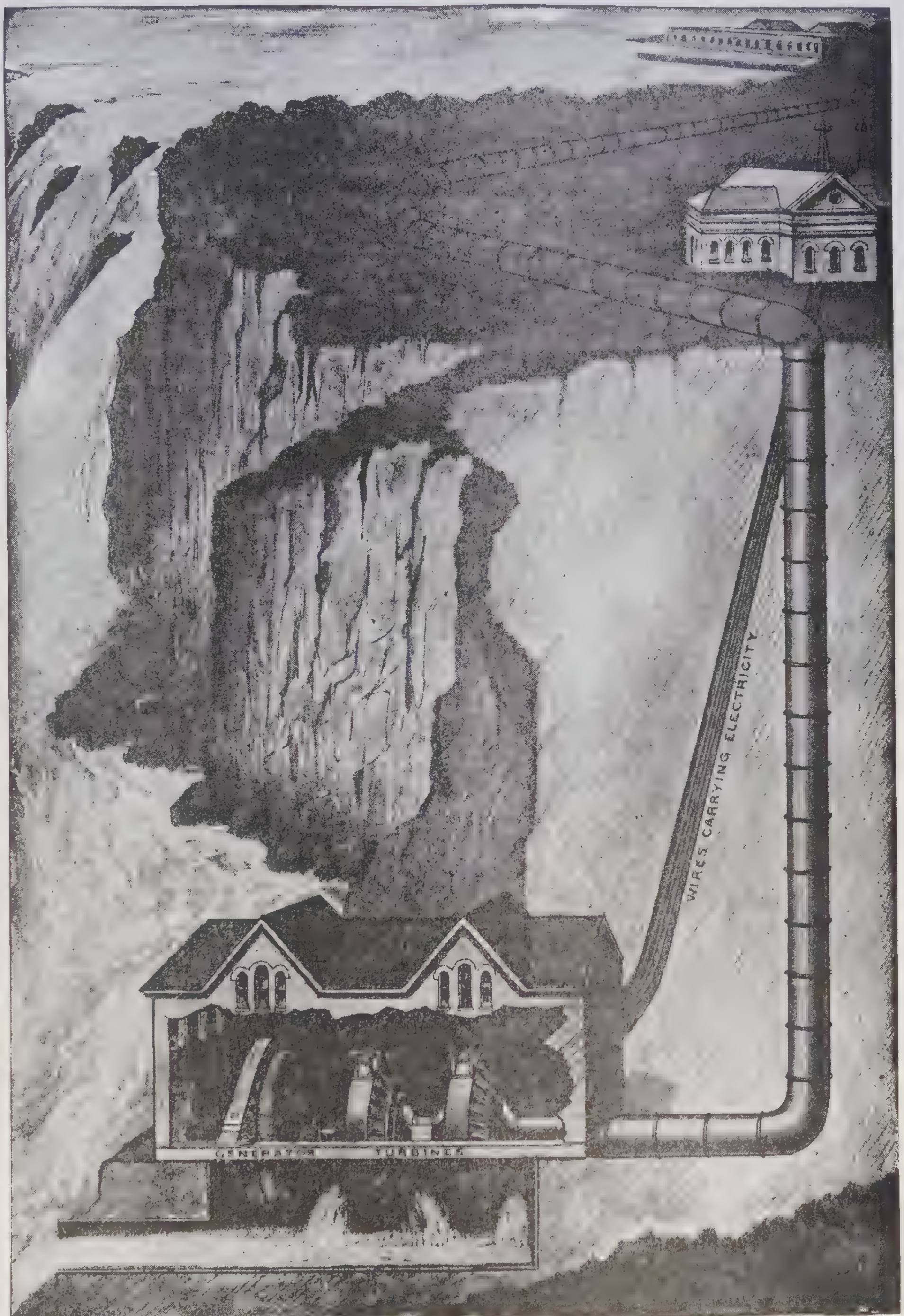
Land can be ploughed in less time; seed is sown by a drill instead of by hand; there is less hand work in cultivation, and reaping takes less time also. Then wheat is threshed by machinery instead of being beaten out by flails. Fewer people raise more grain than seventy-five years ago.

THE MAN WHO FOUND OUT ABOUT RUBBER

Another important invention was that which made possible the use of rubber. Rubber, which is the sap of a tree, was known to the natives of South America before the discovery of America, but was unknown in this country until 1800, when some was brought by a sea captain. The natives of South America made clumsy shoes of it, and some were sold in the United States. After about 1823, many men tried to make rubber cloth, but did not succeed, as it melted and stuck in summer, and cracked in winter.

Charles Goodyear, who was born in New Haven, Connecticut, in 1800, was a hardware merchant, but was not successful. He became interested in rubber and tried many experiments. It is said that in 1838 or 1839, he accidentally dropped some rubber and sulphur on his kitchen stove and found that he had by chance succeeded in doing what he had failed to

HOW NIAGARA SENDS POWER 300 MILES



We see at a glance, in this picture, how Niagara Falls are harnessed. A great wall is built out into the river to divert part of the water to what is called the forebay. From here the water passes into the penstock, the huge pipe through which it falls 180 feet with terrific force, turning the turbines at the bottom. The turbines, in their turn, drive the generator, which generates the electricity. The current is carried by wires to the distributing station above, and is then sent all over the surrounding country.

do by experiment. This process is called vulcanization, and was the beginning of the rubber business.

We use rubber so much now that it is hard to understand how people ever got along without it. Millions of pairs of boots and shoes are made every year. Rubber blankets and rubber coats are much used; belts are made of rubber, and hose for fire companies and for the garden requires a great deal; hot water bags and cushions take thousands of pounds, and much is used to make rings to seal jars and bottles. Pencil erasers, tennis balls, and rubber stamps also require large quantities.

During the past twenty years, millions of pounds have been used for tires for motor cars and other vehicles. One can hardly think of the motor car with iron tires, and every year more carriages are fitted with rubber tires, to say nothing of bicycles. These are only a few uses of rubber. You can name dozens of others yourself.

Mr. Goodyear and his brother, who was also interested, next began to try to make rubber hard. They were successful in 1851 and now combs, buttons, bottles, inkwells, penholders, fountain-pen barrels and many other things are made of hard rubber. The chief difference in making hard and elastic rubber is the amount of sulphur and the degree of heat used. Mr. Goodyear seems to have been a poor business man, and though he took out sixty patents on his inventions, he did not gain much money and died a poor man.

SLEEPING CARS WHICH MAKE LONG JOURNEYS POSSIBLE

In this country distances are so great that it is often necessary to spend one or more nights on the train. Once people had to sit up in the uncomfortable seats and try to sleep in any way they could. Now one can have a good bed, and many persons sleep as well on the train as they do in their own homes. The first car arranged for sleeping was planned by a man named Woodruff in 1856, but it was not very comfortable. In 1863, George M. Pullman, a carpenter and builder, of Chicago, built a car on a new plan which could be used as an ordinary car during the day, and arranged for sleeping at night. It was much superior to anything ever known before, and now Pullman cars are used on every railroad in the country, and one can go quite comfortably from Boston to San Francisco. The company which he founded not only builds these cars, but also parlor cars, and dining cars, and furnishes attendants to go with them. The conductors and the porters are paid by the Pullman Company and not by the railroads. Mr. Pullman also invented the method of enclosing car platforms so that one can pass easily from one car to another without danger of being thrown off.

WHAT MAKES HIGH BUILDINGS IN THE CITIES POSSIBLE

On other pages you see some of the high buildings in New York, and other cities. Without elevators such buildings would be impossible, as no one would care to climb ten, twenty or thirty flights of stairs several times a day. There are more high buildings in America than anywhere else and so it is natural that the elevators should be better.

The first passenger elevator in the United States was invented by Elisha G. Otis in 1853, but has been much improved since. At first elevators were very slow and not very safe, but now they move very rapidly and accidents are not common. Nowadays most elevators are run by electric power, though there are many which are raised or lowered by water pressure. We call these hydraulic elevators.

SOME IMPROVEMENTS IN STOPPING RAILWAY TRAINS

When railways first began to run trains were short, the cars were light, and speeds were not great. Hand brakes worked by a wheel and a chain were able to stop the cars, though accidents sometimes occurred. As speeds grew greater accidents grew more frequent, for the brakemen could not always stop the trains in time. As you know, the swifter the speed and the heavier the object, the more difficult it is to stop quickly.

The man who made it possible to run the heavy trains of to-day at high speed was George Westinghouse, who was born in Central Bridge, New York, in 1846. While still a boy he served in the Civil War, and then went to college. It is said that one day his train was delayed because of a collision which had occurred because the engineers could not stop their trains, and that he began to plan some way of stopping trains more quickly. In 1868 he invented an air brake, which was carried on the engine. Air was compressed, and when released ran through pipes under the cars and pushed the brakes against the wheels. The invention worked, but has been much improved since. The chugging you hear on an engine standing at the station is the air brake, which stops the train or prevents it from running away when going down grade. Mr. Westinghouse also made other inventions, and built great works to manufacture electrical machinery.

THE SEWING MACHINE, WHICH HELPED THE WOMEN

No one man invented the sewing machine, which has been of so much benefit to the world. In the days when all seams were sewed by hand people generally could have few clothes for there was not time to make them. Now many garments can be made in a very short time, and can be sold at a much lower price than was possible before the invention of the sewing machine.

An Englishman made a sort of sewing machine as early as 1790, and a Frenchman followed in 1830, but neither came into common use. Two other Englishmen patented a machine in 1841, but the first really successful machine was the invention of an American, Elias Howe, which he patented in 1846. At first he could get no one to furnish the money to manufacture machines and sold the English rights for $1,200. For years he was wretchedly poor. Finally he was able to interest some men with money and became wealthy.

Other men have also done work on the sewing machine. The improvements of A. B. Wilson and Isaac M. Singer were important. The latter introduced the treadle, so that the machine could be worked by the feet, instead of by hand as before. Other machines, for sewing leather, and similar thick substances, were invented later, and now there are dozens of different types, all good, and American machines are sold all over the world. In the great factories the machines are often run by electric power.

There are many inventions of which one never hears, that have added very much to our convenience and comfort. Once shoes were divided into two classes, those in which the sole was sewed on by hand, and those in which it was fastened on by wooden pegs or iron nails. The first kind was very expensive and the second kind was stiff and uncomfortable. In 1871 a man named Goodyear, who was related to the rubber man, invented a way by which the soles could be sewed by a machine. The shoes made in this way were not so good as those made entirely by hand, but they were much better than those which had the soles nailed on.

This was only the beginning of inventions used in making shoes. Dozens have been made since, nearly all of them by Americans, and now the American shoe factories are one of the wonders of the world. Some of the machines are shown you in another place, where we tell you how shoes are made.

VARIOUS INVENTIONS WHICH MAKE LIFE EASIER

You were shown, in the story of Bread and Butter on page 1137, the old-fashioned mills where wheat was ground between two stones. In 1875 F. Wegmann, an American of German blood, invented a way of crushing the wheat between smooth steel or porcelain rollers. In this way a larger quantity of flour was gotten from a bushel of wheat, and the flour was whiter.

It is not certain that the invention of the roller-mill, as it is called, has been altogether a good thing. The flour that was ground between stones in the old-fashioned mill was not so white, but it did have all the life-sustaining properties of the wheat. In the attempt to make flour as white as possible, some of these are often left out, and go with the waste. Animals then get what we need. Man has seen the harm of this and now much flour from roller mills contains these valuable food materials.

We use the telephone so much that it is hard to think of a time when we did not have this easy way of talking with our friends or with the grocer or the butcher. You have been told how an American, though he was born in England, invented this instrument. Nearly all the improvements on it have been made by Americans, and now an American, Professor M. I. Pupin, has discovered a method by which he thinks we shall some day be able to telephone across the ocean with no more difficulty than we now talk to a neighbor.

ONE MAN WHO HAS HUNDREDS OF PATENTS

One man has invented so many things that a list of them would fill several pages of our book. This is Thomas A. Edison, and we give a special article to him and his inventions.

We must mention the type-setting or type-casting machine, which is described under The Wonder of a Book, on page 947. This was invented by Ottmar Mergenthaler, and this machine, with some improvements, is used in the office of every large newspaper to-day.

As we have said many times, no one man ever makes a perfect machine. The idea of the automobile is old, for every locomotive is an automobile, but not until the gasoline engine was invented could a motor car which was both light and strong be made. The first gasoline engines were not very reliable, and the first motor cars often had engine trouble. The same is true of motor boats. Many men both in Europe and America have helped to make these engines successful, and it is very difficult to mention one without mentioning a dozen others.

HOW THE CONVENIENT TYPEWRITER WAS INVENTED

The business man of to-day would not know how to get along without the typewriter. On it letters are written quickly and legibly, and copies can be kept, so that much trouble may be avoided. Yet the typewriter is a modern invention, and men of fifty years ago knew nothing of it.

Christopher L. Sholes, an editor of Milwaukee, felt the need of a machine to number tickets, coupons and blank books, and set to work to invent one. He succeeded, and then decided to make a writing machine. Several men had already tried, but their machines were clumsy and got out of order easily. With two friends, Mr. Sholes secured a patent in 1868. The machine was heavy and clumsy, and corrections could not be made, but the right idea was there. One of the letters written on this machine fell into the hands of James Densmore, and he bought a share in the patent. Model after model was built, each a little better than the one before, and, in 1873, the invention was bought by Remington and Sons, who owned a fine machine shop, and gave the new machine their own name. Sholes sold his share for $12,000, but Densmore preferred to receive a small sum on every machine made, and is said to have received a million and a half dollars before the patent expired. Many changes and improvements have been made in the Remington machine, and in many others which have been patented, but to Mr. Sholes is due the credit of the first practical typewriter.

An inventor who turned his mind to many things was Thomas Blanchard, who invented a machine to pare apples while only a boy. Next was a machine to count tacks, then made by hand. Soon he invented a machine to make the tacks, which is still in use, though somewhat improved. His most important invention was the copying lathe, which copies exactly the model placed in the machine. This was first used to make gunstocks, and lasts for shoes, then used so much. For many years Mr. Blanchard was employed in the United States Arsenal at Springfield, Massachusetts, and there the original lathe may be seen to-day. Another machine, for bending wood for shipbuilding, or for making curved handles for ploughs and other tools, and making wooden wheels, brought him in more money than his more important inventions.

AMERICA'S SHARE IN CONQUERING THE AIR

Very great difficulty is found in giving credit to any one man for the invention of flying-machines, except that we can say that there is no doubt that the share of the United States has been the largest. The most credit belongs to Professor S. P. Langley, of the Smithsonian Institution in Washington, though his machine never really flew. But his experiments showed the way, and the Wright brothers, Orville and Wilbur, in a small Ohio city, were the first to make machines which would really work. The Wrights have made improvements themselves, and in Europe many machines a little different have been made, but our share in the glory of conquering the air is the largest.

There are hundreds of other inventions of which we might speak. The bicycle as we have it to-day is almost entirely American, and the convenient hand camera is also. In our story about moving pictures we tell you something about the cameras which have been made. Electric locomotives to pull heavy trains are American, as also is the greatest improvement in weaving machinery. Then too there are thousands of little things which we cannot mention, but enough has been said to show you that American skill and genius have done much.

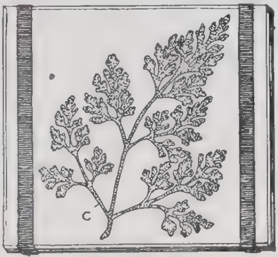
THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 2787.

PHOTOGRAPHY WITHOUT A CAMERA

CONTINUED FROM 2591

MOST people think that nobody can take a proper photograph without a real photographic camera, but this idea is quite wrong. We shall see how any boy or girl can take a photograph without a camera.

In picture 2 there is a photograph of a lake scene, and on the next page is shown a picture of a little girl and a photograph of some leaves. Well, these photographs were taken without a camera of any sort. It took about half an hour to do them, and each one cost only a cent or two.



1. The photographing frame.

If we would like to do some like them, we must first go to a shop where they sell things for photographers and ask for a packet of "self-toning" paper. All photographic shops keep it, and it is not at all expensive. One packet will last a long time, and we can take twelve big photographs, or forty-eight little ones, about the size of the one on this page, with it.

Then we must ask for one pound of "hypo." This is also very cheap. That is all we need to take our photographs: just one packet of self-toning paper and one pound of hypo.

2. Photograph of picture taken without a camera.

We open the packet of paper, and find that it is shiny on one side. Now, if we cut a little piece off one sheet, and take it out of doors into the light, we shall find that in a few minutes the shiny side begins to turn dark. We can watch it getting darker and darker until it is quite black. If we hold it by one corner, we shall see that the little piece our finger has covered will remain as white as it was when we first took the paper out of the packet. This is because the light could not reach the place which was shaded by the finger.

When we have done this we shall understand what photography really is. We shall see that we have a wonderful kind of paper which turns black when it is taken into the daylight; and, if we shade some parts from the light, those parts will remain white while the rest of the paper becomes dark.

Now we can see that if we lay a leaf or a small flower on the paper, and leave it in the light for a little time, we shall get a perfect copy of that leaf. That is the way the photograph of leaves on the next page was taken.

Of course we shall find that the leaves, when we first pick them, are crinkly, and will not lie flat on the paper. We must press them closely to the paper by putting a piece of glass over them if we want our photograph to be clear.

The best way is to get a small piece of glass about five inches long and four inches wide. Probably we can find a piece in the house. A glass from an old picture or photograph frame will do quite well. Then we should cut a piece of thick cardboard the same size as the glass, and get two strong elastic bands to hold them all together.

Now, whenever we want to photograph the leaves we lay them first on the glass, then put a piece of the paper over the leaves, and the cardboard over the paper. The two elastic bands slipped over the glass and paper, in the way that is shown in picture 1, will make everything ready for taking the photograph.

We have now only to take it all out into the light, and leave it in the sun until the paper seen through the glass has turned quite black. Then we must take it indoors, and when we slip off the elastic bands we shall find a wonderful picture of the leaves, with all the delicate veins showing clearly.

Now, we must understand that this picture has appeared in this wonderful way because the leaves have shaded some parts of the paper while the other parts have been getting quite dark. If we take our photograph out into the daylight again, it will become dark all over, and the leaves will not show any more. We do not wish this to happen, so we must do something else before the photograph is really finished.

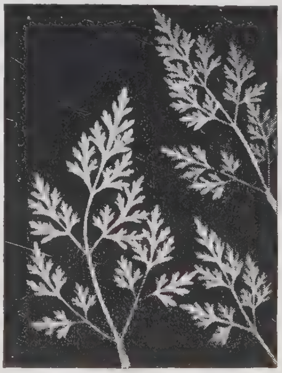
We must use some of our hypo. This stuff looks something like the soda we have seen in the kitchen. Well, we must take some of this hypo—about two teaspoonfuls will be enough—and put it into a soap-dish and pour some water on it. In a little time the hypo will dissolve in the water, and then we must put our photograph in it and leave it there for ten minutes. It will turn red at first, but will afterwards get dark again. When this is done, we take the photograph out and put it into a basin of water.

3. A portrait taken without a camera.

It is best to leave the basin under a tap in the sink, and let the water run into it for two hours; or, if we have a washhand-basin with a tap over it, we can put the photograph into that. It must be washed in clean water for at least two hours, or it will not last. We have now only to take the photograph out and let it dry, and it is finished.

When we have done one, we shall probably like it so much that we shall want to do a lot more, so we must look for new things to photograph.

Perhaps when we were at the seaside last summer we brought back some pieces of that pretty pink seaweed. If so, we shall find that this makes lovely photographs. Some kinds of feathery grass make very pretty pictures, too; and little pieces of fern look lovely if arranged so that they group nicely before the photograph is taken.



4. Photograph of leaves taken without a camera.

We know one boy who is so fond of making these pictures that, whenever he goes out into the country, he brings home leaves from the different trees he sees. Then he photographs them, and puts the pictures into a little album, and underneath he writes the name of the tree each leaf came from.

Of course, there are lots of things that one can photograph besides leaves and flowers. We can copy pictures of people or outdoor scenes. Any picture from a book or a magazine can be photographed without a camera, if it has been printed on paper that is white at the back.

In THE BOOK OF KNOWLEDGE you will often find a colored picture in the volume. We can make a photograph of one of these very easily. All we have to do is to take the colored picture and put a piece of self-toning paper against it. Then we put them both between the glass and the cardboard, exactly as we did with the leaf or fern, and leave it all in the sunlight.

When we take the paper out, we shall find a copy on the self-toning paper. We shall, however, find that the black lines of the picture are white in the photograph; and if we do not like this we must take another photograph from our photograph, and then everything will be right. We shall have a real copy of the picture, with the dark parts dark and the light parts light, just as they should be.

When our friends see how well we can take these photographs, they will probably ask if we cannot copy some portraits for them. This is just as easy if the portraits have not been stuck upon cardboard. If they have been "mounted," as photographers say, we must first soak them in water for a few hours, and then peel them off the card. Then, when the portraits are dry, we can use them just as we used the pictures from THE BOOK OF KNOWLEDGE, and we shall be able to do just as many photographs of our friends as we want.

Remember, for copying other pictures we must take two photographs, because the first one shows the faces black. This first photograph that we get is called a "negative"; but when once we have taken it we can make as many photographs from it as we please, and the second ones will be just like the real portraits which our friends lent us in the first place.

ANSWERS TO THE GAME OF "WHY IS IT?" ON PAGE 2588

1. The space allows for the rails to expand when heated by the summer sun.

2. The friend's image is reflected from the glass at the same angle as that of the little girl in the corner looking into the glass.

3. Rays of light from the steps and the shell did not reach our eyes in a straight line, but bent down towards our eyes on passing from the water into the air. So the shell and the sand appeared higher than they were.

4. A three-sided lustre in the glass chandelier acted as a prism and broke up the sunlight into the bars of color.

5. The call echoed from the rock on the opposite side of the valley, at an angle the mother knew would just reach her son.

6. The corner of the handkerchief acted as a siphon, and the scent passed up along the threads in the material and down into the rest of the handkerchief.

OTHER PIECES OF BOX FURNITURE

WE can hardly decide which of these articles we want to make first. Shall it be the flower stand, the shirt-waist closet or one of the others? It certainly is not easy to choose, for they are all attractive and we shall want to make them all in time. We are becoming skilful carpenters, for our journey into Box Furniture Land has given us experience with many articles. We have finished a scrap box, a foot-stool, a general utility box, among other articles, and now we shall attempt some pieces of furniture which are just a little more difficult. The distinctive feature of our furniture is the corner brace or trim. And this, we remember, is always made by placing the face of the wide strip of wood at right angles against the edge of the narrow one. Full directions are given under each article, so you will have no difficulty in making them. All ready now with our boxes!

A FLOWER STAND

"HURRAH for Billy," said Mother, when her son presented her with an artistic flower stand with a plant on it, as a surprise for her birthday. "For a long time, I have wanted just such a place to have for my geraniums, and now I have one that is made so nicely." "I knew you would be surprised," replied Billy, "because we have kept it in the garret and worked on it while you were away, and all the materials and the plant included were bought with the twenty-five cents you gave me for having a good report card." "How did you make it?" asked Marjorie, his cousin, who was visiting him. "I wish I could make one for my Mother, too." "It's easy enough," said Billy. "I'll tell you."

Materials Needed.

"The grocery boy brought his order one morning in a good-looking candle box, and I asked him to leave it. He did so. Then I went to the carpenter's shop around the corner and asked him for material for the legs. As the box was 14 inches square and 7 inches deep, I wanted four strips, ⅜ inch thick, 1 ¼ inches wide and 9 inches longer than the outside depth of the box; and four more strips ⅜ inch thick, 1 ½ inches wide and 9 inches longer than the outside depth of the box. Besides this I needed two pieces for cleats to strengthen the shelf, and so asked for two strips ½ inch thick, 1 ½ inches wide and 14 inches long."

Directions for Making.

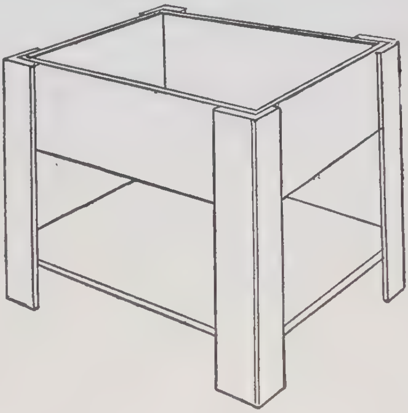
"It's the easiest thing in the world to make," said Billy, "but I'll write out the directions for you, so you will not have the least bit of trouble." So Billy wrote down on a large piece of paper just the way that Marjorie ought to make the flower stand. And here is what he wrote:

"Take the cover off the box. Don't sit on it, for you will want it in a jiffy. Use a tack-claw in pulling out the nails. Don't split the wood by jerking them out in a hurry.

"Get your big sister Nan to help you on the next part, because two can have more fun than one. Here's the leg job.

"Put the four narrow strips in one pile (Pile No. 1), the four wide strips in another group (Pile No. 2). Take a narrow strip from Pile No. 1. Put it flat down on the floor in front of you. Take a wide strip from Pile No. 2. Stand it up straight on one edge, bang up against No. 1, but not on top of it. That's what you call a right angle. You'll know that when you study Geometry. Now then, Marge, while Nan holds the two pieces together, hammer the nails in. That makes one leg. Make three more just like that. That stunt is done. Hurrah!

"Turn the box on its side. Let Nan hold one leg in place, keeping the upper end even with the open top of the box, while you get busy with your hammer and nails. Nail on all legs.



"Now, where's your cover? Find it and plane off the good-looking side. Turn it over and nail on two strips for cleats on the wrong side. Call it a shelf.

"Turn your stand upside down; set the shelf in place, making it four inches from the end of each leg. Put two nails through each leg into the edge of the shelf. Don't let the shelf slip while you drive your nails.

"So far so good. Take a piece of coarse sandpaper, and rub the stand all over, then take a piece of fine and give the finishing touches. Now for a small can of Jap-a-lac. All girls love to flourish a paint brush. Put on one coat, let it dry over night. Then sandpaper it a bit and apply a second coat.

"Now then, Cousin, your job is done. So give a war-whoop, and dance a jig around your flower stand.

"Perhaps you can get a pan which will just fit inside, so that if water slops over it will not make the bottom wet so that it will warp."

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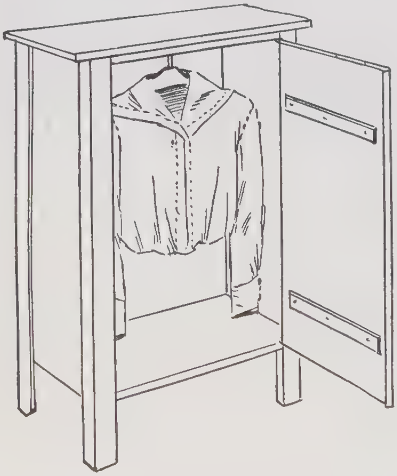
SHIRT-WAIST CLOSET

A SHIRT-WAIST closet is quite an inexpensive bit of furniture, and yet it is very useful and attractive. The carpenter lad in his work must not forget his big sister who sometimes helps him in his studies, nor the good Mother who constantly takes many stitches for him. So this chest is something which the boy can make especially for his grown sister or his Mother, and he may be sure that it will be appreciated. It is a novel idea to have a special closet for blouses to keep them fresh and clean. A bureau drawer is the usual place to keep waists, but very often the blouses get crumpled, mussed and wrinkled. A shirt-waist closet would delight the heart of a school-girl, and it certainly is not hard to make, if you start with the box as a foundation. So, girls, if you have not a big brother, get to work yourself and surprise your friends with your ability as a carpenter.

MATERIALS NEEDED.

The packing box necessary should be about 12 inches deep, 22 inches wide and 34 inches long. If you prefer, you may find a box that is deeper so that it will hold several more shirt-waists.



The door is made from the cover of the box, but you will need door-cleats, or strengthening pieces, consisting of two strips ½ inch thick, 1 ½ inches wide, and 4 inches shorter than the outside width of the box.

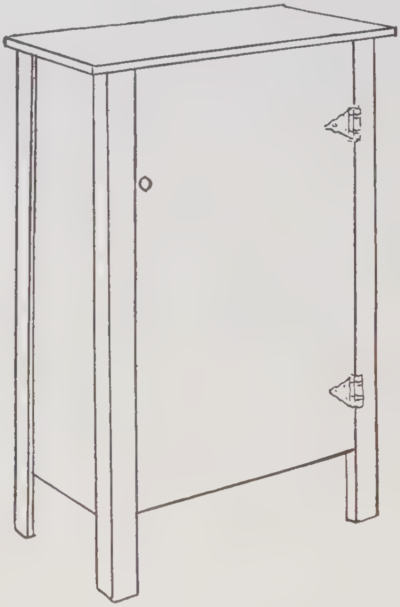
The top should be a piece of wood ½ inch thick, 3 inches wider and 3 inches longer than the outside width and depth of the box.

Again we need to go to the hardware store, and this time we want two 1 ½ inch T hinges and screws; one porcelain pull-knob; one brass button and screw; six wire hooks; and six coat hangers.

The last thing needed is material for the legs. Four of the strips required should be ½ inch thick, 1 ½ inches wide, and 4 inches longer than the outside length of the box; the other four strips should be the same thickness and length, but 2 inches wide.

DIRECTIONS FOR MAKING.

You may think that a closet is more complicated to make than the articles which you have already made, but in reality it is very simple to construct. By this time you have become an expert in the matter of making the legs, which is the distinctive feature of this style of furniture, so you will hardly need to be told how to make them. Just remember that the legs are four inches longer than the outside length of the box, and that they should be carefully planed and smoothed with sandpaper so that they will take a good finish. Remove the cover from the box; turn the box on its side and nail on two of the legs, then reverse the box and nail on the other legs. Nail the cleats on the back of the cover, which now becomes the door. Remember that the door is to swing between your strips and it must therefore be narrowed to fit by sawing off a strip 3 inches wide, or the same width in two strips.

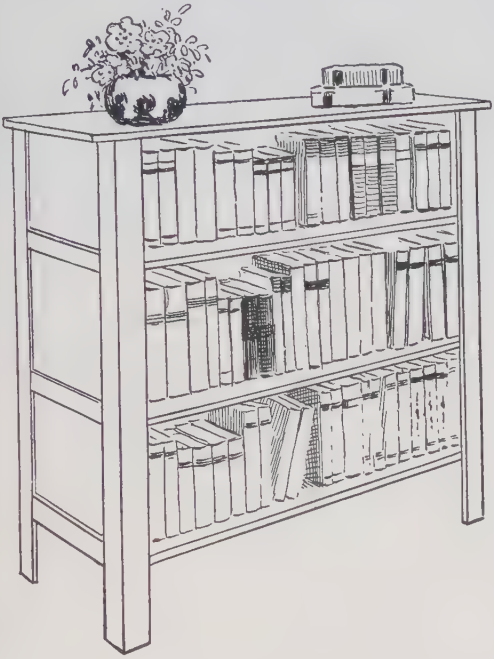


If you want to know why cleats are used, see page 1360 (in the article on joints). Place the hinges between the edges of the door and the leg, and hang the door. Turn the closet right side up, stand it on its legs, and nail on the top, letting it overlap the edges the same width all around. Screw the six hooks into the under side of the top at the centre of the closet and place a coat-hanger on each hook.

After an application or two of paint or varnish, the closet is ready for use. Just make one for Sister, and see how pleased she will be, for next to curly hair, there is nothing that a girl so much desires as pretty things for her room.

A SIMPLE BOOKCASE

OF the many attractive and useful articles which a boy can make for his own room, or in fact for the library, or for Father's den, a simple bookcase, like the one illustrated here, will well repay him for his time and energy. Every boy likes to have his own books kept together, and takes pride in adding to his collection of good books, if he has a suitable place to keep them. How many boys own a bookcase which is really their own personal property? Not many boys, perhaps; but here is a bookcase that every boy can own, because he can make it himself at very little expense. Isn't it much more fun to make things for your room than simply to walk in a store and select something ready-made? Then there is another advantage in making your own furniture, for you may have the articles as large or as small as you please to suit the space in your room, and you may finish the articles to harmonize with your color scheme. So, boys, wake up and get some boxes. Of course, when we say "boys," that includes the girls, for the girls are often quite as capable in using a hammer and saw as the boys. And this is a secret which you must not tell, or the boys may be jealous: some girls are better carpenters than the boys.



Materials Needed.

Of course, the first thing you need is a box; that goes without saying. This time you want a great big packing box, or canned-soup box. It does not matter whether the grocer calls it a soap box or a cereal box, as long as the size is right, and you must ask for a box about 12 inches high, 10 inches deep, and 25 or 30 inches long. You want three boxes just alike in size and shape.

For the legs, you need four strips which measure ½ inch thick, and 1 ½ inches wide, and 4 inches longer than the height of the three boxes combined, and four more strips of the same thickness and length, but 2 inches wide.

For the top, you will need one piece of board about ⅝ inch thick, and 3 inches wider than the outside depth of the box after the cover is removed, and 3 inches longer than the outside length of the box. For the facing strips for the sides, you must have six strips ½ inch thick, 1 ½ inches or 2 inches wide, and about 7 inches long.

Directions for Making.

The materials may sound confusing, if you read them in a hurry; but if you follow the directions one step at a time, you will be surprised how easy the work will be. First of all, remove the covers from all three boxes, and smooth off any rough edges, planing them down so that they are all three the same depth. Then take two of the boxes, and place them so that they are open towards you, and nail them together. Stand them up and place the third box on top, nailing it on also, keeping the open sides facing the same way.

Make the legs in the usual way by joining a wide and a narrow strip. Nail on the four legs, keeping the upper ends even with the top side of the last box. Place the stand upon its legs, and nail on the cover for the top, letting its edges project 1 inch over the outside face of the legs all around.

Now we are ready for the facing strips at the ends which are used to cover the seams where the boxes are joined and to give a neat finish. Look at the picture to see just where the three strips are placed at one end, nail the three strips on one side, and make the other end to correspond. Now your bookcase is quite complete, and ready for the varnish or stain.

If you wish to make the bookcase look even better, follow these directions below. Before applying the varnish, you may give your work a neater finish, if you add three narrow strips of wood, each the length of the bookcase, between the front legs, and just wide enough to conceal the edges of the boxes. Nail these three strips in place, taking care to keep them exactly over the edges.

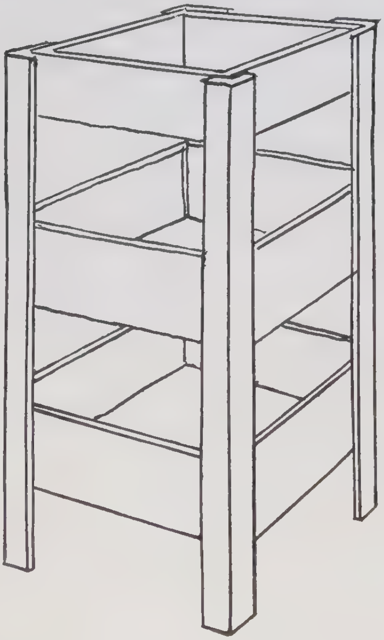
ODDS AND ENDS STAND

THIS stand will be found a convenient receptacle for all kinds of small articles, and will be useful in almost any upstairs room. In the boy's room, it will serve as a place to keep some of his smaller toys and games; in his sister's room, it will prove an attractive sewing stand; in the nursery, it will make an ideal stand for the baby's playthings and necessary medicines. There are countless ways of using this bit of furniture, so, boys and girls, get busy with your tools, and see how nicely and quickly you can make this model.

Materials Needed.

Just as a good cook gathers all her required utensils and materials before starting to bake a cake, and a general summons all his troops before going to battle, so the efficient carpenter mobilizes his forces before setting out to conquer. In this case, the carpenter's boxes are the veteran forces, and the rough boards, his raw recruits, which must be trained and drilled into serviceable material.

The carpenter captain selects good sturdy boxes that will withstand the wind and weather, discarding any battered or fragile boxes which look as though they had been through the war. The ideal box for this purpose should be about 8 inches high, 14 inches long, and 12 inches wide. A box that has served its apprenticeship as a bottled-bean box would make a good soldier for you. Three boxes of the same strong build will be sufficient. Four thin strips of board about ⅜ inch thick, 1 ⅛ inches wide and 40 inches long will serve as part of the legs, and four more strips ⅜ inch thick, 1 ½ inches wide and 40 inches long will be needed for the other section.



Directions for Making.

Nail together a wide and a narrow strip to form the leg, which should be about 40 inches long. Measure to see that all four legs have the same length. Take the three boxes and remove the covers. Turn one of the boxes on its side and nail on two of the legs, keeping the upper ends of the legs even with the top of the box at its open end. Take another box and place it on its side, allowing the legs to project four inches beyond the bottom of the box, and making the open top of the box to face in the same direction as the open top of the first box. Measure the space between the top and bottom box, and locate the third or middle box at an equal distance between the two. Nail the legs to this centre box. Turn the three boxes upside down, and nail the other two legs on the opposite side, measuring carefully to see that the boxes are equally spaced as on the first side.

The stand is completely built and ready for the finishing touches. A can of varnish or stain will work wonders on the appearance of the article. A yard or two of dainty muslin or figured cretonne, pleated and nailed at the edge of the top box, will give a pretty touch to it if Sister is going to use it as a working or sewing stand. Work out your own idea as to the color scheme and it is surprising how pretty you can make such a simple thing as an odds and ends stand.

This same design would be useful in a sick-room as a medicine table. You know that at one time or another there is illness in nearly every home, and at such a time a stand like this would save the time and strength of the nurse or those looking after the invalid. For right here on this stand the medicine bottles may be kept with no danger of falling off, and the breakfast tray may be placed on the top within convenient reaching distance of the patient.

So, you see, there are many different uses for this little stand, and you will be proud of the fact that you yourself fashioned it.

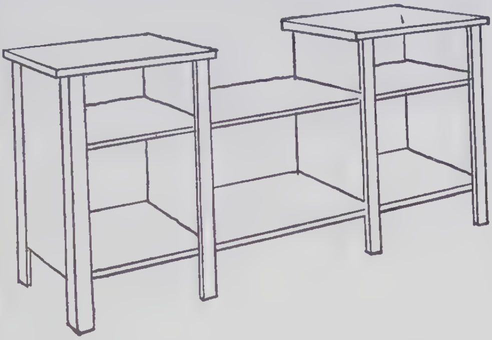
A REFERENCE STAND

THERE are a great many things that a boy can make for the general use and convenience of all the family, and when he makes his articles out of boxes, he is especially pleased with the good results he may obtain at very little expense. Nothing that the handy boy might make would be more appreciated than the reference stand shown in the sketch. For a boy's room it would prove a veritable treasure-chest in which to keep a great variety of toys and games. One shelf might hold his tops and balls, another his camera, films, and photographic materials, while the lower compartments will be large enough for a tennis-racket, boxing gloves, or even his tools and electrical equipment. The middle compartment could be provided with a hinged door and a lock, and here the lad may keep under lock and key, his special treasures. If we should mention any further uses for this handy stand, every boy, and some girls too, would immediately set to work to make one. So while you are all eager to get busy, we shall tell you just what to do.

Materials Needed.

We may persuade our amiable friend, the grocer, to part with three good Kirkman's Borax Soap Boxes, for if he is as abundantly supplied with soap boxes as most grocers are, he will be grateful to you for removing some extra boxes which are only in his way. However, if he has not many superfluous boxes, he may ask five cents for each box. Any box will do that is about 11 inches deep, 15 inches wide and 25 inches long. This size is not compulsory, but is convenient. Be sure that the three boxes are alike in dimensions.

For the legs, we need four strips ⅜ inch thick, 1 ⅜ inches wide, 6 inches longer than the outside length of the boxes; and four more strips ⅜ inch thick, 1 ¾ inches wide, and 6 inches longer than the outside length of the boxes.



Two top boards will be needed, each piece ½ inch thick, and 2 inches wider than the outside depth of the box with the cover removed, and 2 inches longer than the outside width of the box.

Besides the legs, it will be necessary to have four facing strips for the inside supports, and these pieces must be ⅜ inch thick, 1 ¾ inches wide, and 6 inches longer than the outside length of the long boxes.

Directions for Making.

Make the legs first, and see that they are 31 inches long, or 6 inches longer than the length of the boxes. Then remove the covers from the three boxes. Take off one end from each of two of the boxes, reserving these ends for use later on as shelves in these boxes. Stand these two boxes upright on end, placing the third box lengthwise on its side between them. Mark the right height for the shelves, so that they will be level with the top of the middle box which is placed on its side. Nail the two shelves in place at this height. Now fasten the three boxes together, taking care that the open compartments all face the same way. Study the picture before you start to nail, and you will see just how the boxes are placed. Fasten on the four legs, one on each outside corner, taking care that the upper ends are even with the top edge of the end sections of the stand. The two top pieces may now be placed on the end sections, so that each top projects ⅝ inch over the outside face of the legs at the front, rear and end. Nail on the four inside facing strip legs, two on the front, and two at the corresponding points on the rear side, so that the joints between the boxes are covered. As usual, sandpaper, putty up any cracks or imperfections, and varnish in the color you prefer.

THE THINGS YOU HAVE LEARNED

We have now learned a great deal about the possibilities of the ordinary boxes we can get from the grocer, and how they can be transformed into both useful and ornamental pieces of furniture. You have been told about the tools, and how to use them, have learned of the materials needed, and have been told the way to use stains and varnishes to make your work look better.

Our first effort, you remember, was the Miniature Plant Box, which is made so easily, and yet looks so well. We followed that with the Scrap-Box, which is a little more difficult, and showed how, with a little more work, it could be made into an attractive Hanging Flower-Box. This was followed by another Scrap-Box, which could also be used as a Hanging Lantern for a veranda or a hallway. The Footstool which came next was really no harder than some of the things which you had seen before, though you were told how you might make improvements on the simple design if you chose.

Our next group of designs was more difficult, for here we began to take our boxes apart, and change their shapes, or to put on hinges and handles. The General Utility Box is easy, if we are careful, though, of course, if we put a cushion on the top we must not make any mistakes. The useful Blacking Box requires some care, but the result is worth all the trouble. No article we have described is more useful than the Small Wall Rack, which we can make any size desired. It can be used for books, for flowers, for pipes, or the cook can find many uses for it in the kitchen.

The articles described above in this last section are rather more difficult to make than the earlier ones, but if you have practised on those which are shown before, you will have little trouble. The Flower Stand is easy, but the door of the Shirt-Waist Closet is nice work. The Simple Bookcase needs only attention to the directions, and the same is true of the Odds and Ends Stand. The Reference Stand is put last, and should not be tried until you have made some other things.

When you have made these, there is no reason why you can not make more difficult pieces either from your own or from Miss Brigham's designs, about which you were told in the first story of Box Furniture.

A USE FOR WALNUT SHELLS

Open walnuts carefully with a knife, so as not to break the shells, and take out the nut. Then fasten them together again with stiff gum or glue, having first put a tiny present inside in place of the nut—a china animal or doll, a paper cup folded very small, a ring, a toy insect, a chocolate, or you can write a conundrum on one slip and put the answer in another shell. These walnuts must be mixed up with a dishful of ordinary nuts.

MORE WAYS OF HAVING FUN IN THE WATER

AFTER you have learned to swim well there is no limit to the fun you can have in the water. We have already told how to do some simple tricks on page 1362. Here are some others which you may try in the summer time, or even in a tank at other times.

WALKING IN THE WATER

Do you think that you can not walk in the water? Well, just try it, for you will be surprised what you can do. First, lie flat on your back in the position for floating, then start swimming feet foremost, using the leg action only. Quietly push one foot after the other with toes pointed, and give a downward pull, as though walking on a treadmill. The trick is not to kick the water away, but toward you. It is easy to do, but progress is slow.

ROLLING LOG

Take a position for floating again, then hold yourself quite stiff, and clasp your hands high over your head. Take a deep breath, and with a movement of the head turn over like a rolling log, and keep on revolving rapidly. This is a breath-holding stunt, so remember to fill the lungs full of air. This is easy for the fat boy, but the tall thin one will have to wriggle considerably in order to revolve swiftly.

TORPEDO

Fill your lungs with a great deep breath, take the floating position, throw the hands high above the head, and with a rapid propeller movement of the hands, shoot forward feet first. The entire body, except the toes, is submerged. It is easier to do this trick in salt water, as the fresh water has less buoyancy.

RELAY RACE

Two men who are fast swimmers act as captains, choosing teams of four men each. The captains take their places at the rear of the lines and at the signal, "Go," the first man in line dives off and swims to the stake, touches it, turns around and swims back, touching the goal. The next man in line dives in over the head of the returning swimmer, and so on. The best swimmer has been saved for the last, so the contest becomes very exciting. The team which finishes first is the winner.

CANOE RACE FOR HAND PADDLERS

Four boys in bathing suits, and two canoes are entered for this race. Two boys are seated in each canoe, one in the bow and the stronger lad in the stern. Paddling with the hands over the sides of the canoes, they struggle to reach the goal.

PEANUT AND SPOON RACE

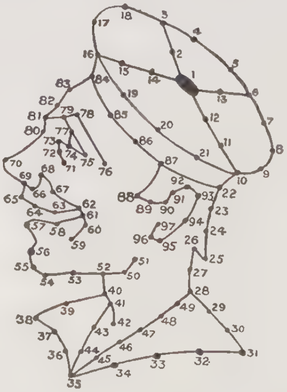
Each contestant has a dessert-spoon with a peanut placed on it, and takes his place in line in the water with the other players. With the spoon-handle in his mouth, the swimmer starts at the signal, "Go!" and tries to reach the stake, turn around it and return without dropping the peanut. If the peanut falls, the swimmer is out of the race.

CANDLE RACE

On the float or dock, set up a row of candles, with matches near by. The boys all line up in a row a few yards distant. At the signal, "Go!" the swimmers start for the candles, vying with one another in lighting them. The one who lights his candle and swims back, reaching the goal first, is the winner.

SOLUTION OF THE PUZZLE OF THE LAUGHING SAILOR

THERE are, altogether, 14 ways in which the puzzle of the sailor's face on page 2586 can be done. The dots have been numbered, and the order in which we pass them in the different solutions is as follows:



I. 1. 12. 11. 10. 22. 23. 24. 25. 26. 27. 28. 49. 48. 47. 46. 45. 35. 36. 37. 38. 39. 40. 52. 50. 51.

II. 1. 12. 11. 10. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 44. 43. 41. 40. 52. 50. 51.

III. 1. 14. 15. 16. 84. 83. 82. 81. 80. 70. 69. 66. 68. 67. 62. 61. 58. 57. 56. 55. 54. 53. 52. 50. 51.

IV. 1. 14. 15. 16. 84. 83. 82. 81. 80. 70. 69. 65. 64. 63. 62. 61. 58. 57. 56. 55. 54. 53. 52. 50. 51.

V. 1. 12. 11. 10. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42.

VI. 1. 14. 15. 16. 84. 85. 86. 87. 22. 23. 24. 25. 26. 27. 28. 49. 48. 47. 46. 45. 35. 44. 43. 41. 42.

VII. 1. 13. 6. 7. 8. 9. 10. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 44. 43. 41. 42.

VIII. 1. 14. 15. 16. 17. 18. 3. 4. 5. 6. 7. 8. 9. 10. 22. 87. 86. 85. 84. 83. 82. 81. 79. 78. 76.

IX. 1. 2. 3. 18. 17. 16. 19. 20. 21. 10. 22. 87. 86. 85. 84. 83. 82. 81. 79. 77. 75. 74. 73. 72. 71.

X. 1. 12. 11. 10. 9. 8. 7. 6. 5. 4. 3. 18. 17. 16. 84. 83. 82. 81. 79. 77. 75. 74. 73. 72. 71.

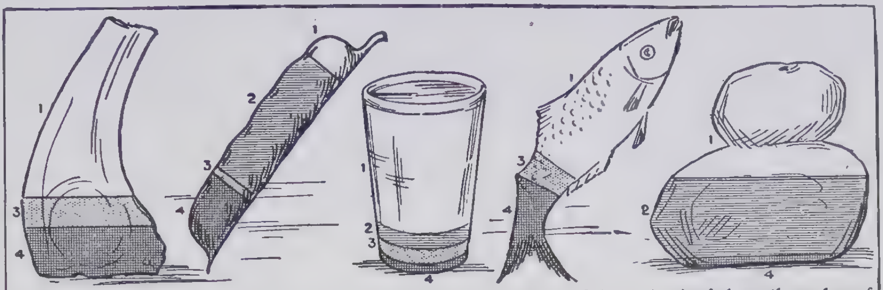
XI. 1. 13. 6. 7. 8. 9. 10. 21. 20. 19. 16. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97.

XII. 1. 13. 6. 5. 4. 3. 18. 17. 16. 19. 20. 21. 10. 22. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97.

XIII. 1. 13. 6. 7. 8. 9. 10. 22. 87. 86. 85. 84. 83. 82. 81. 80. 70. 69. 66. 68. 67. 62. 61. 60. 59.

XIV. 1. 13. 6. 7. 8. 9. 10. 21. 20. 19. 16. 84. 83. 82. 81. 80. 70. 69. 65. 64. 63. 62. 61. 60. 59.

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 2805.



These pictures of a meat chop, a pod of peas, a glass of milk, a fish, and a loaf show the value of these foods to the body. The parts marked 1 are water; 2 and 3 are carbohydrates and fats, which give the body energy and warmth; and 4 is proteid, which rebuilds the body as it wears out.

FOOD AND ITS USES

CONTINUED FROM 2650

WE have already seen that muscles are the furnaces where fuel is turned into work, and the ordinary name for muscle-fuel is, of course, food. By far the greater part of the food which we daily consume is for the use of the muscles, including the heart and the muscles of breathing, as well as the muscles of locomotion, and of the arms. Now, we have already learned something about the machinery which exists in our bodies for taking in food and changing its useful parts, so that they can enter the blood and be carried by it to every part of the body. And here we must go on to find what food is made of; to learn what it is that makes bread a good food, and firewood no food at all; and how we may be guided in our choice of what we eat.

First, as the body is a furnace and a machine, which makes power or work out of fuel, it must be supplied with something that will burn, and with enough of it. The fuel supplied must not merely be burnable outside the body, when a flame is put to it, or when it is thrown into a furnace, but it must be burnable inside the body, at the temperature of the body, which is very low compared with that of even a tiny flame. Now, firewood will burn—that is to say, the elements of which it is made are not combined with as much oxygen as they would like, and will take more if they can. But firewood will not burn at the temperature of the body—or, indeed, at temperatures a great deal higher. So, though it is fuel for a furnace, it is not a fuel or food for man. The same is true of coal. It consists mostly of carbon, and our bodies burn large quantities of carbon every day; but coal, as charcoal, will not burn at the low temperature of the human body. We may take charcoal powders, and eat charcoal biscuits, but not a single atom of the carbon in them combines with oxygen in our bodies. It may be a medicine, but it is not a food.

Suppose, now, we knew that the body must have carbon to burn, and had to find out how to give it the carbon it requires. Wood, coal, charcoal, we find, are useless, if we try them. Plainly, we must try some of the compounds of carbon, compounds which contain less oxygen than will satisfy the atoms in them. Carbon dioxide, for instance, would not do, for that is fully burned up already. Now, one of the cheapest compounds of carbon is starch, and perhaps that will meet the body's need. We think of starch as something to make clothes stiff, but it is one of the most important of man's foods.

Knowing, as we do, that all the world of life is knit into a whole, that animals depend on plants, and plants on animals, we should expect starch to be useful, when we know that every green leaf everywhere is making starch whenever light falls upon it. If you take a leaf, before sunrise, and clamp a little part of it with a pair of flat corks, and then, at the end of the day, take the corks away, wash the leaf in alcohol, and add a little iodine to it, the whole leaf will turn blue except at the spot which the corks covered. That spot will be white. The reason is that the leaf has been making starch in itself all day, except where the corks prevented the light from reaching it. The alcohol washes away the green chlorophyll from the leaf, and then the iodine, which is the test for starch, reveals it by turning the leaf blue where starch is present. Do not apply this test for starch by spilling tincture of iodine over a shirt-front; but if you do so accidentally you will have no doubt about the blue color made when starch meets iodine.

This experiment is worth describing here, even although we are talking about food, because it is possible to measure how much starch the leaves make.

THE GREEN LEAVES THAT ARE ALWAYS AT WORK FOR US

We know how much starch we require every day, and so it is possible to say how much foliage must be at work every day for every human being, not to mention the lower animals. One square yard of leaves will produce about fifteen grains of starch in an hour. If you and I are to get all the fuel we need to-morrow, each of us requires to have 500 square yards of leaf working for an hour—or, say, 100 square yards working for five hours. That, we understand, is just an average. The exact figure would vary with the intensity of the sunlight falling upon the leaves, the amount of work we did in the day, the size of our bodies, and so on. But it is well that we should think of ourselves as daily dependent upon a multitude of green leaves somewhere, which are translating the energy of sunlight into a form that we can use.

But if we take starch outside the body, and heat it in the air to the temperature of our blood, we do not find that it burns. The same is true of sugar and bread and meat, even when they are completely freed from water. Yet all these things burn inside the body, and are foods just because they do so. We find that the body has within itself the power of causing things to burn under conditions of temperature, and so on, in which they would not burn outside the body. This is done by means of chemical substances called ferments, which exist in the blood and in every living cell in the body.

So far we have thought of food as simply fuel for our engines, the muscles, that have work to do. But the food has other uses, and we need other kinds of food besides those that are simply fuel.

THE FOODS THAT FEED THE FURNACES OF OUR BODIES

These other kinds of food we must learn about, but we have purposely begun with the question of fuel-foods, because by far the greater part of the whole bulk of our food is required as fuel; and also because we know more about the uses of food as fuel than we do about its other uses. We must also recall what was said on page 2648 about the contraction of a muscle. The furnaces of the human body are required not only to produce work, but also to produce heat. Thus we owe to the burning of our fuel-foods all the work done by our muscles, visible and invisible, and all the heat which is made by our bodies. It is these two needs that account for the great quantity of fuel we require, and for the frequency with which the supply of it has to be renewed. If it fails, our temperature very quickly begins to fall.

But now we can look at foods more generally, to see what other purposes they serve than those of fuel. Let us consider our bodies, and ask what are the things that they get every day from outside themselves. Let us mention everything, whether we are accustomed to look upon it as food or not.

THE VALUE OF AIR AS FOOD, AND HOW WE MAY HUNGER FOR IT

The things that our bodies receive daily from the outside world are: air, water, light, salts, fuel-food, and proteids.

1. AIR. We do not think of air as a food, yet there is no more reason for calling the carbon food than there is for giving the same description to the oxygen which is to combine with the carbon in our bodies. Any proper idea of what is meant by food must certainly include air, or, rather, oxygen. It is incessantly being used up in our bodies, and new supplies are always needed. It is possible to be *hungry*, too, for this very valuable food; and in some kinds of illness, where enough oxygen can hardly

get into the blood, it is terrible to watch the unhappy person's "air-hunger," as the Germans quite properly call it. People are very likely to have fads about their food. It is a pity they cannot learn to be more particular about the quality and purity of their air-food, or of that which they condemn other people to live upon.

ALL OUR LIVES ARE LIVED, AND MUST BE LIVED, IN RUNNING WATER

2. WATER. The second thing which our bodies receive every day from without is water. We do not often think of this as a food; but there we are wrong. By far the greater part of our bodies consists of water; and it is a specially notable thing, as true of an oak or a microbe as it is of ourselves, that, for life, there must be a ceaseless circulation of water. Not merely is all life lived in water, but it is all lived, and must be lived, in *running water.* No matter what kind of living creature we examine, we find that it is always *giving off water,* and unless this loss is supplied it will soon cease to live. Few things in Nature are more wonderful than the giving off of water—a sort of perspiration—by the leaves of a plant, and the way in which the roots drink the water from the soil and send it up to the leaves. But we too are constantly losing water. On an average each one of us loses about six pounds of water every day of our lives by the action of the skin, the lungs, and the kidneys. Of course, this means that the same amount of water must be taken into the body somehow every day; and thus there is no more necessary or important food than water.

THE GREAT NECESSITY FOR WATER AND THE TERROR OF THIRST

We can learn a good deal from the very unpleasant feats performed by fasting men. If a man can store up in his body anything he needs, then he can do without fresh supplies of it for a time. We cannot store up oxygen to last us for more than a few minutes. But we can store up enough of the fuel kind of food, especially in the form of fat, to last quite a long time. A man may go quite without eating for forty days, but that is because his body is, during all that time, using up the fat that it has stored. But no man can store up water in his body, and so the fasting man always has to be allowed as much of this food as he pleases, just as he has to be allowed oxygen. Not even the fasting man, then, is an exception to the universal law of all living matter, that it must have an unfailing supply of fresh water supplied to it, in order to keep going that stream of water in which all life everywhere is lived.

This helps us to understand how it is that thirst is so terrible, and why living creatures, suffering from thirst, will drink the most horrible things if there is no other way in which they can get water. We understand, also, why madness follows upon lack of water after a very short time, as we know in the case of shipwrecked sailors. Children live very quickly, so to speak, for they are naturally very active, and, unlike grown-up people, they are growing fast. They need a frequent supply of water, and suffer very severely if it is not forthcoming.

THE POWER OF WATER AND LIGHT AND SALT IN KEEPING US ALIVE

There are few things more cruel than to deprive a child of water, or to expect it to learn its lessons well when it is thirsty. A child's brain cannot act properly if the blood does not carry sufficient water to it. Doctors, also, have lately learned that, when Nature demands water for a feverish child, Nature must be obeyed.

In most books water is not reckoned to be a food because it is not burnable—it is, of course, already burned—and because it does not go to make any of the tissues or stuffs of the body. But, as every living tissue is itself built up and lives on water, and as this water must never be allowed to become stagnant, it is plain that we ought to regard water as one of the most important of all foods.

3. LIGHT. Another of the things that enter our bodies is light. Under this we may include not only the visible light that strikes the eyes and the skin, but also all kinds of invisible radiation from the sun and from the atoms of the air, which also strike and enter our bodies. These things have power and energy in them; they do enter our bodies; and we know that nothing is ever lost. Something must happen to them, and the fact that they enter the body just as surely as air, or water, or bread,

does, should not be forgotten. Up to the present, however, students of the body have not studied this subject.

4. SALTS. The case of the salts proves to us at once that a thing may be a food even though it supplies no power to the body, not being burnable food, and even though it does not make tissues. Certain salts are absolutely necessary for life, and as they pass by no means slowly away from the body, the supply of them needs to be constantly renewed. We do not yet know nearly all their uses in the body, but we know some. Several kinds of salts are necessary, though there is only one kind—common salt, or sodium chloride—that we actually add to our food. The other kinds are sufficiently supplied by their natural presence in food. We need calcium salts, for instance, and there is actually more calcium in milk than there is in limewater. Vegetables and fruits are principally of value because of the salts they contain. When we cook a cabbage we dissolve into the water the most valuable part of it—the salts it contains—and then throw the water away! Meat also—that is, the muscles of ox or sheep or pig—contains a great deal of salt; but of all our food-stuffs fruit is best so far as salts are concerned.

THE USES OF SALT AND THE PART IT PLAYS IN OUR LIFE

We look upon common salt as a thing with which to flavor food, like mustard and pepper. But, while these are not foods, salt is a necessity of life. Not only does it play a necessary part in the blood and the tissues, in a way we do not yet understand, but it is perhaps the source of one of the important products of the stomach, without which the digestion of our food would be difficult. We remember that common salt is sodium chloride, and it therefore may be the source of the hydrochloric acid which is poured into the stomach some twenty minutes or half an hour after every meal we eat.

If the body of an animal or a human being be burned, we find that there is always left an ash; and this ash consists of the salts that were in the body and that cannot be burned. Important among them would be the salts of calcium, which give strength to the bones and to the teeth. If a bone be placed in an acid, and the salts melted away, the bone becomes quite soft, and can be tied into a knot. So these salts are specially important as part of the food of babies and children who are making their bones and teeth. Salts of iron, too, are necessary for the blood, and it is easy to prove that there is a rich and constant supply of salts of iron in milk.

THE THREE FOODS THAT MAKE UP THE CHIEF PART OF OUR DIET

5. FUEL-FOODS. And now we come to the foods which make up the bulk of our diet, and are all burnable. They are of three kinds and no more—*carbohydrates*, *fats*, and *proteids*. Carbohydrates is the name given by scientists to compounds containing carbon, combined with hydrogen and oxygen; and proteids are the important compounds containing carbon, hydrogen, oxygen, nitrogen, and sulphur, that are found in all animals and vegetables. Of the three foods, the first two—carbohydrates and fats—are pure fuels and nothing else; they are burned in the body, making heat and power. The fat can be stored in large quantities, and the body can turn either carbohydrates or proteids into fat if it desires to store them up, as often happens when we eat more than we have need for. But the body cannot store up carbohydrates in quantity, and cannot store up proteids at all. Here it differs from the body of a plant, for that can store up its food as a carbohydrate—starch. The wax which bees make out of sugar is a carbohydrate—sugar—being turned into a fatty substance.

THE FUEL-FOODS THAT GIVE US HEAT AND POWER

Most of the fat we eat is of animal origin, such as the fat of meat, the fatty part of the yolk of an egg, and the fat in milk, cream, and butter. All these forms of food are expensive compared with most vegetable food, and it is the vegetable world that gives us most of the carbohydrates we eat—sugar and starch. It seems to matter nothing at all to the body whether its fuel be supplied as fat or as carbohydrate; but perhaps sugar, if not starch, has the advantage over fat, that it is more easily digested, besides being much cheaper. There is no doubt which Nature prefers for children; though, if we are careful, children will take more fat than is sometimes supposed. The best form of fat for children is also the dearest—cream.

Unlike any of the things we have mentioned hitherto, such as air, water, and salts, the pure fuel-foods, sugar, starch, and fat, are not necessary for life. It is possible to live without ever taking the smallest quantity of any of them. This is so because it is possible to burn proteid food, and use it as fuel. Fuel, of course, we must have in some form or other. But it would be very unwise for anyone to use proteids only as his fuel-food, and to give up the carbohydrates and the fats. In the first place, the proteids are very much more expensive; secondly, they require much more digestion, on the whole; and thirdly, when the proteids are used as fuel-foods they do not burn up completely into water and carbon dioxide, as fat and sugar do, but they produce all sorts of other substances which it is very bad for the body to produce in it from day to day. In time they poison the body and make it "old," as we say; and that is what happens to people who live to eat, and so do not take a natural diet, with a natural balance of the various kinds of food in it.

THE FOOD THAT BURNS AWAY OUR BODIES AND THE FOOD THAT REBUILDS THEM

For immediate result, and simplicity of digestion, sugar is undoubtedly the best fuel-food. That is why children, who are so active, and are specially in need of heat-producing foods owing to their small size, are naturally fond of sugar and sweet things. If a child is always allowed just as much sugar as it feels inclined for, it is not likely to make itself ill with eating too many sweets, as children do who have been starved of sugar.

Now we may leave the carbohydrates and fats, remembering that while they must take a second rank as foods because it is possible to live without them, yet they are exceedingly useful and valuable; and probably to take more of them than we really need is not nearly so harmful as it is to take more than we need of proteids.

6. PROTEIDS. Proteids are the last class of foods that we need, and there is something special about them which, in a way, raises them above all other foods in importance. We have described the body as a sort of engine which needs fuel, and so it is. But it is a living engine, which itself is burning and being destroyed from day to day. If it is to go on living, as, indeed, it does so well that no engine made by man can compete with it for lasting power, it must be supplied with food which will make good its wear and tear; and the only food which will do this is proteid.

THE FOOD THAT EVERY LIVING CREATURE NEEDS TO REPAIR ITS BODY

Every living creature requires a supply of proteids to make good its wear and tear; but only one kind of living creature, those that have chlorophyll, can make proteid for themselves. All others, including all the plants, like mushrooms, that have no green chlorophyll, and all animals and human beings, must have ready-made proteid supplied to them. There are many different kinds of proteids, but most of them are suitable food for us, whether they come from the animal or the vegetable world. They are changed by digestion into the special kind of proteid that is found in our blood.

However richly a man may be supplied with water, salts, starch, sugar, and fat, he cannot live without proteids. But we should clearly understand that the proteid is required not as fuel, for sugar and starch are better fuels, but as a means of repairing the body waste. Proteid can be used as a fuel if necessary, so that it is possible to live without fats or carbohydrates, as we have seen. Very many people take far too much proteid food, especially in the form of meat. They take it simply because they like it; but they do not know the consequences.

HOW POISON MAY COME INTO OUR BODIES THROUGH OVER-EATING

If sugar and starch and fats are taken in excess, they can be stored up as fat. It is a peculiarity of proteid that it cannot be stored. It must either be used, or broken up and got rid of; and that is what happens when we take more proteid than we need, as most well-to-do people do every day of their lives. Unfortunately, the breaking-up of proteid in the body is a difficult business, proteids being enormously complicated compounds, and many of the products of this breaking-up are mild poisons. If they are being continually produced in the body, they gradually injure the health of the blood-vessels, and of the kidneys, skin, and other parts of the body which are concerned in getting rid of them. This is a very serious matter, and explains why continued over-eating produces its very evil consequences.

THE AMOUNT OF FOOD WE NEED AND THE CLOTHES WE WEAR

Of course, we ought to know about how much of these various things are required in our food every day. What we need varies very much according to many circumstances. In the first place it is certain that some people are more economical with their food than others; they can get out of a small diet as much work as other people will get out of half as much again. These are natural differences which cannot be explained. Also the size of the body affects its needs very markedly. The Japanese have small bodies, and apparently, as a race, are able to make a little food go a long way, even apart from the fact that they are small. In the Russo-Japanese War, one of the great advantages enjoyed by the Japanese was that their soldiers required very little food, while the Russians required a great deal.

Climate and clothing also affect the amount of food we need. In warm air we lose heat less rapidly, and so we require much less fuel. Our appetites are naturally lessened in hot weather, and if we are wise we respect the warning. If we are foolish we try to cheat our appetites with dainties. In very cold climates large quantities of heat-producing food are needed. Thus, the Eskimo lives largely on blubber, which is fat. Similarly, other things being equal, the more clothes we wear the less food we need.

HOW THE WEIGHT OF FOOD A MAN EATS DEPENDS UPON HIS WORK

Muscular work very greatly affects the quantity of food we need. This, of course, we know, must be so. The appetite of men doing really hard muscular work is very great. It has to be, if sufficient fuel is to be supplied to the muscular engines. Mental work scarcely affects the amount of food needed.

In all these cases, it is the quantity of the heat and work foods—fat and carbohydrates—that should vary. Circumstances do not affect so much the need for proteid food. Here are some figures giving an idea of the quantities of food required. A soldier is allowed, in this country, a pound of bread and three-quarters of a pound of meat a day, together with additions like salt and so on. When he is on active service he is burning more fuel, and so he is allowed one and a quarter pounds of bread and a pound of meat. Of course, these weights include a good deal of water; and in our food in general, not only is there naturally a great deal of water, but there is also a proportion which cannot be digested and is only waste matter. So the figures showing the weight of the food a man eats in a day are very different from those showing the quantities of actual food material by which he lives.

An average diet for a man would be about six pounds of water, one ounce of salts, fifteen of sugar or starch, three of fat; and as to proteid, probably three ounces is abundant, though twenty years ago a much higher figure would have been named. The quantities of all foods but proteid must be increased for severe labor, and very much lessened if a person is going to stay in bed.

WHY A BOY MAY REQUIRE MORE FOOD THAN A MAN

Of course, the figures vary in proportion to the size of the individual; but a small man requires far less food than a boy of the same weight. In other words, children need a quantity of food quite out of proportion to their weight, for while adults merely have to maintain their bodies, children are *making* their bodies. Children, therefore, require not merely a large supply of food in proportion to their weight, but they require a specially large proportion of proteid, for proteid alone, as we have seen, will actually make a living tissue. When we come to study the more important foods, we shall see how carefully Nature has supplied this need for proteid, in the food which she prepares for young human beings, and for all the young animals that belong to what are called the mammalia. Another special need of children is calcium, for bones and teeth; and so we find milk rich in calcium, and should give children plenty of foods that are rich in calcium, such as eggs and oatmeal.

THE NEXT PART OF THIS IS ON PAGE 2827.

WHAT THE WISE MAN TELLS US

IN this part of the Book of Wonder the Wise Man tells us many things we have often puzzled our brains about. He tells us why it is that we dream, and says that no dream has any particular meaning, and that all our disagreeable dreams or nightmares merely arise from indigestion or some other disturbance in our system ; he tells us why sleep-walkers sometimes walk in the most dangerous places without being hurt ; why the moon appears to travel with us when we walk, and why its reflection follows us on the sea ; he tells us what makes such pretty dimples in smooth, round cheeks,—angel's kisses, we sometimes call them, but have we ever thought of their natural cause ? Moreover, and besides all this, he informs us why we sometimes feel afraid when we do not wish to do so, and why the fear of the dark and of loud noises is so strong in little children.

WHY DO WE DREAM?

CONTINUED FROM 2655

THE brain has many parts, and some part of it may be asleep, while another part is awake and active. That is what happens when we dream. Most of the brain, especially the highest part of it, is asleep in a dream, but parts of it are awake, and these, unguided by the highest powers of the mind, work on the materials of past experience, especially recent happenings. Perhaps only the very deepest sleep is entirely free from dreams, and it seems certain that most of us have dreams of which we remember nothing when we wake.

The more vague and shadowy and the more easily forgotten a dream is, the fewer are the parts of the brain that have been awake; but when we have long and complete dreams, very clear, and very clearly remembered, then it is probable that more of the brain has been awake. The fewer dreams we have, the better it is, for that means that our sleep has been more complete ; and if we are to have dreams, it is best to have the kind which are scarcely remembered. *No dream has any meaning about the future.*

WHAT IS A NIGHTMARE ?

By far the worst kind of dream is a nightmare—a dream which seems very real, and is intensely horrible or frightening. When nightmares occur often they should be attended to. They may be due to illness such as heart disease, or some disease of the nervous system, or indigestion. Many students of this subject believe that they are caused altogether by feelings that have been aroused at some past time by an unpleasant experience such as a shock, or even by reading an exciting book, and that the thought of this, though we have forgotten it, comes back in our sleep. These students say that the best way to overcome nightmare is to fill our minds with good thoughts about beautiful and useful things, and so crowd out the ugly and hateful things. Children who have bad dreams should not read dime novels. Besides the unpleasantness of nightmares, we should remember that they mean that the sleeper is not getting sleep of the best quality, and his waking hours will suffer accordingly.

WHY DO WE DREAM WE CAN DO THINGS THAT WE CANNOT DO WHEN AWAKE ?

The reason why we seem to do quite impossible things when we dream, and are never surprized at doing them, is that, when we dream, the very highest part of our brain, the part which has to do with our knowledge of ourselves, and with judgment and with the power of distinguishing between what is real and what is only fancied, is asleep, and so is unable to do its work. When we are awake we may often " build castles in the air," or imagine ourselves doing all sorts of wonderful things ; but the highest part of the brain remains active, so that all the time we know well that we are only imagining these things—not really doing them. We know fact from fancy. But when the highest part of the brain and the power of the mind that goes with it are asleep, fancy seems like fact. Sometimes, even in day-dreaming, we gradually pass from the ordinary fancies of a waking person into a state where these fancies seem real ; our judging and reflecting powers have " taken forty winks." Probably all stages can be traced, from fancy which we know to be fancy, to the wildest dreams that seem to be reality.

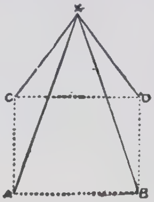
IS SLEEP-WALKING DANGEROUS ?

Sleep-walking is not a very uncommon thing, though it is commoner in slight forms than it is in extreme forms. There is nothing alarming in it, and there is no reason to suppose that it does any harm to the walker. It is rather unusual, and that is the worst we can say of it. We need only remember that the best place for the sleep-walker to wake in is his bed, simply because he will not be frightened if he wakes there.

He can usually be persuaded quite easily to go back to bed—for people in his state always readily take suggestions. Their conscious mind is asleep, and does not interfere as it might if it were awake. Of course, it is possible that the sleep-walker may hurt himself, so that he should guard against such chances. Yet the sleep-walker is wonderfully careful ; even if he crawls over a roof he seldom comes to harm, unless someone foolishly wakens him, for his conscious mind is asleep, and so he has no fear ; and it is fear that makes the danger of many dangerous things.

WHY DOES THE MOON APPEAR TO TRAVEL WITH US WHEN WE WALK ?

The moon and other objects in the sky are so far away that as we walk we notice no difference in our position compared with them. The nearer a thing is to us as we move, the more do we notice its change of position compared with ours. We can prove this by comparing the various things we see when we are in a train. The telegraph posts seem to rush past, the fields move past not so quickly, a tree on the horizon almost seems to travel with us, and the moon or the sun *quite* seems to travel with us. It is only when the road turns a little, or the railway curves, that we seem to leave the sun or the moon behind us.



The explanation of all this is simply that the eye judges, not by real distances, but by angles. Look at an object, *X*, from two positions side by side, *A* and *B* ; then move nearer to the object and see it from two other similar positions, *C* and *D*. The imaginary lines joining our eyes and the object form the angles *A X B* and *C X D*, and, as we can see, the angle becomes greater the nearer we move to the object or the nearer the object moves to us. Of course, we must distinctly understand what we mean by the size of an angle, or we shall never understand this point. The size of an angle has nothing whatever to do with the *length* of its arms, but with the *width* of the *angle* between them.

WHY DOES THE MOON'S REFLECTION FOLLOW US ON THE SEA ?

This is a question that has puzzled many people. It looks as if, wherever we choose to stand on the seashore, the moon throws its light on the water just opposite us, and if we move, the moon alters the path of its light on the water just to suit us. But if two people are together, and one walks and the other does not, they both see the light of the moon in the sea. And if we placed a long row of people all along the shore they would all see a line of light, and they would have to agree among themselves that *the whole of the sea*, and not merely the line of it between the moon and any one of them, was brightly lit up, as a line of it appears to be lit up to each of them. That is, of course, the fact ; the whole sea is lighted as brightly as the line we see. As the light strikes the sea from the moon, it is reflected, and passes onwards in the same line, just as a ball does when it is thrown on a smooth surface.

So our eyes catch the light that rebounds from the sea straight to them, and miss the light that is reflected on either side. Move to one side, and we catch the light we missed before. And so the line of light seems to move, because as we move we see fresh lines of it. The line is broader when the sea is rough, because then many of the little waves are placed at angles, so that they turn the light towards our eyes. In the same way we often see a glint of sun or moon on the water out of the main line altogether, because for a moment a wave like a little mirror has been just so placed as to cause the light which strikes it to reach our eyes.

WHAT MAKES A DIMPLE?

In order to understand a dimple, we should know the structure of the skin and what lies underneath it. In most parts of the body the skin, with its outer horny layer, and the inner living layer, which carries nerves and blood-vessels and makes the horny layer afresh from day to day, lies very loosely upon the layer of tissue beneath it. This is a loose layer, containing a certain number of fibres running in all directions, with fat-cells lying between them in healthy people—except under the skin of the eyelids, where fat is never found even in the fattest people. A few of these fibres are attached to the under surface of the skin, so that, though we can move the skin about very freely over what lies beneath it, this movement is, nevertheless, limited.

But where there are dimples, as on the face, and often round such joints as the knee and the elbow, the number of fibres attached to the under surface of the skin is much increased, and they are rather short, so that the skin is depressed, or dimpled, at these points. We see the same thing produced accidentally in the case of many scars, which are often a little depressed below the general level of the skin because they are tacked down in the same way. But a scar differs from a dimple, as the skin over a scar has been lost, and is replaced by a new thing called scar-tissue, whilst the skin over a dimple is true and healthy skin.

IF MEN ARE GROWING TALLER, WILL THEY EVER BE TWICE AS BIG AS THEY ARE NOW?

The answer is certainly "No." Our increase in stature as compared with our ancestors is due to better conditions of life. We are far cleaner than they were, and eat more regularly. We have better and more nourishing food, and we protect ourselves better from great cold and heat. It is said that people have increased in height about an inch in 1,000 years, and this change in height is due to circumstances, and not to any change in the nature of the body. It is only that our ancestors were not as tall as they should have been, and we, on the whole, are nearer the height that we should be, though thousands of poor children are shorter than they would be if they had plenty of food and sleep.

When we go back to the earliest remains of human beings, we find that the average stature of mankind, though it varied in different races in the past as it does now, has been very constant. The ancient Egyptians of 5,000 or 10,000 years ago were rather short, just as modern Egyptians are. Men of a far more remote age, perhaps 25,000 years ago, who made the caves near Mentone, in France, were quite as tall as the modern Scot or Swede, and so on. Indeed, we learn no more important lesson from the past than that the physical type of man is very nearly fixed. It is his mind, and not his body, that grows; his skull gets bigger, but his legs remain about the same length.

WHY HAVE WE THE FEELING OF FEAR WHEN WE DO NOT WANT TO BE AFRAID?

Our feelings are not under the control of our will. There is no more important fact of human nature. Therefore, it does not matter whether or not we want to feel happy or angry or afraid, we cannot help feeling as we do.

But it is one thing to have a feeling, and another thing to show it, and it is yet another thing to act upon it. We should be quite clear in our minds as to what our wills can do, and what they cannot. As the question suggests, they cannot prevent us from having certain feelings; and they cannot give us feelings just because we wish them. But our wills can completely suppress the signs of feeling, so that a man may look calm, and speak with a steady voice, though he feels very much afraid; and, what is still better, our wills can prevent us from acting in accord with our feelings, so that, though we cannot help feeling afraid, we *can* help running away. We see, therefore, that there are two kinds of bravery. There is the bravery of the man who feels no fear, and so does not run; and there is the bravery of the man who is terrified, *and yet* does not run. And perhaps it is finer to be afraid and yet stand, than to stand because you "do not know what fear is."

WHY ARE WE AFRAID IN THE DARK?

Children are often scolded for being afraid when they are left alone in the dark, but I am certainly inclined to sympathize with them, said the Wise Man. Fear is an instinct, and, like other instincts, it requires certain things to arouse it. The dark is one of these things. The strength of all our instincts varies in different people, and so does the degree to which they are aroused by different things; but to be afraid in the dark is undoubtedly a thing natural, or normal, to young children, and need by no means be a sign of real cowardice, or have anything to do with it.

Many students of instinct have tried to trace this fear of the dark to its origin; and though it is practically useless nowadays, we can understand that it must have been very useful indeed long ages ago, like all our instincts. It would, for instance, prevent children from straying in the dark, and would cause them to cry out so that they could be found if they were lost in the dark. Long ago, when all sorts of enemies, such as wild beasts, were lying in wait for their prey, it must have been a very good thing indeed that children should be afraid of the dark. Many grown-up people who are not cowards sometimes have the same fear, though perhaps they say nothing about it. We may be quite sure, however, of this: there is nothing whatever in darkness *itself* to make anybody afraid for a single moment.

WHY ARE WE AFRAID OF LOUD NOISES?

The fear of loud noises is a fear often noticed in children; and the interesting thing about it is that it is low-pitched noises, and not high ones, that a child fears. Often a child is made miserable by such a noise, even though it is perhaps safe in its father's arms in the daytime, and the father is making such a noise for fun. The child knows that there is no danger *really*, but this kind of noise makes it frightened, and it will beseech its father to stop. If, instead of merely laughing at such a child, we try to think what its fear means, and if we reflect that the kind of noise that it fears most is one which is like a growl, or like the deep roar of a wild beast, then we shall understand. The instincts of human beings are very deeply planted, and ages and ages do not suffice to root them out. If we study ourselves closely, and especially if we study children, we find traces of all the instincts that animals have—instincts still surviving from the time when man lived a wild life as animals do, and when these instincts were of the greatest value for his life.

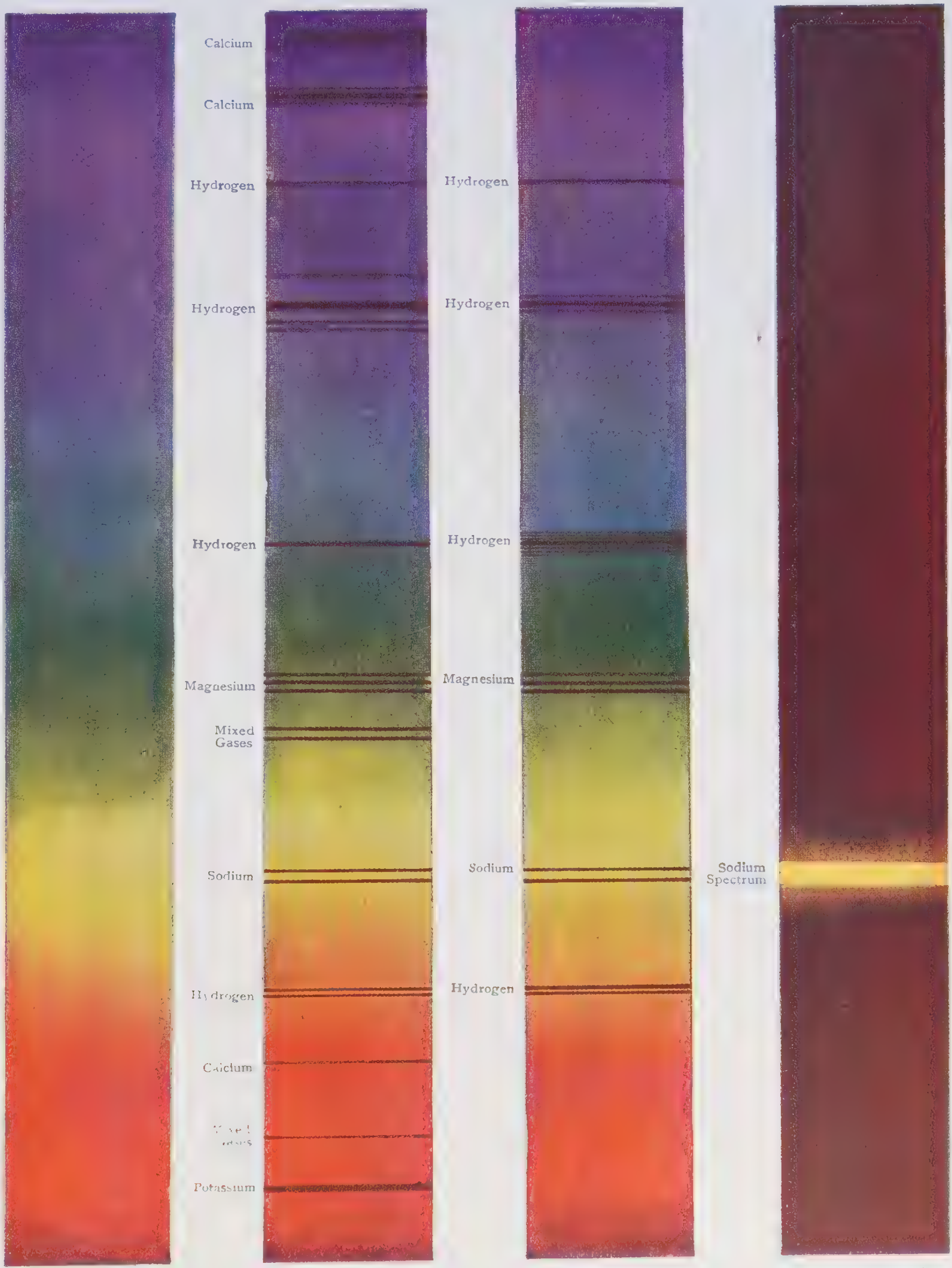
WHY CAN WE NOT FLY LIKE BIRDS?

The more we study living creatures the more must we marvel at the way in which they are adapted to their particular mode of life. If, for instance, a creature is meant to fly, every part of it is adapted to that purpose. The bird's body is as light as it can be; it has large lungs to fill with air, and great air-spaces in its body besides. Then, too, its bones are very strong for their weight. The shape of its body, sharp in front and gently curved, is suited for flight. Its feathers are perfect for their purpose, and are beautifully oiled so that water cannot stick to them, for if it did it would weigh the bird down. The muscles made for flying are enormous in proportion to the size and weight of the whole bird, and they are so arranged in relation to the wings as to give the greatest possible power. The legs are of no use in flight, and are therefore made as small and as light as possible.

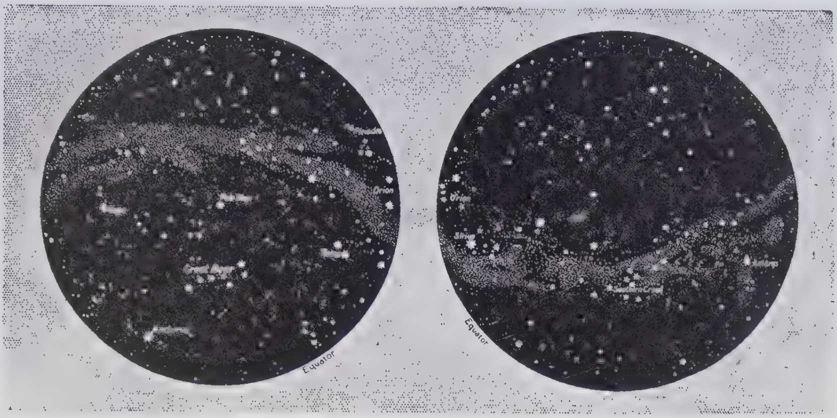
In the story of "Riders on the Wind" elsewhere in this book there are pictures which show how men have learned to fly. But *we* are not meant to fly, but to walk and run. We have neither feathers like the bird, nor long fingers with a membrane stretched between them like the bat. As we are meant to walk, we have strong, heavy lower limbs; the muscles of our arms are very weak compared with the corresponding muscles of the bird's wings; the shape of our bodies is not suited for flight, and so on. Our intelligence has taught us to make machines with which we can fly, but it cannot alter the fact that our bodies are not adapted for flight, and that they can never fly.

THE NEXT QUESTIONS BEGIN ON PAGE 2799.

THE LIGHT THAT EXPLAINS THE STARS TO US



When pure light, as from a white-hot iron, passes through a glass prism, it is broken up into seven colors called the spectrum, as shown in the first picture. But light from the sun shows, in addition to the colors various lines, as seen in the second picture. These lines are caused by some of the different substances that compose the sun. Although here we see only a few lines, the sun's spectrum really shows over 2000 lines. The third picture is the spectrum of a star, Sirius, and when compared with that of the sun, it shows that the stars are made of the same materials as the sun and earth, because the lines in the spectrum for different substances always appear in the same position in relation to each other, as can be seen by comparing these spectra of the sun and Sirius. Although the spectrum color of the metal sodium is yellow, as in the fourth picture, this appears dark in the sun and star spectra, because of the intense light behind it, just as a gas-jet seen in front of the sun's disk appears black; but of course sodium is in the same position in all the spectra.



The Milky Way is the wonderful continuous band of stars that encircles the heavens. The picture on the left shows it in the northern heavens, and the picture on the right in the southern heavens.

THE COLOR OF THE STARS

CONTINUED FROM 2645

BY means of three instruments we are able to study the stars, and learn a great deal about them. These instruments are the eye, the telescope, and the camera. The telescope helps the eye by increasing its acuteness and by adding preciseness to what it observes ; and the camera helps because it is sensitive to certain light of the stars which the eye could not see, even aided by the best telescope that exists. All that these instruments can do, however well they may be employed, and however perfectly developed, is simply to show certain points of light in the sky, so that, as we read on page 2644, we may compare their appearance as seen from different parts of the earth's orbit. There is as yet no hope at all of our being able to see the disk of a star—so far away is even the nearest star that it can be seen only as a point of light. We can, however, learn something more about these points of light by means of the instruments we have named, because we can watch their influence upon each other's movements in some cases, and so can learn something of their size or *mass*.

Now, all this is very necessary and very interesting. We may call it descriptive astronomy—the descriptive study of the stars. But we want to do more than any of these instruments will enable us to do by itself. We are not content merely to map out the heavens, make star catalogues, and calculate the distances of the stars when we can. In every science there is a farther stage. No matter whether you are studying fossils or stars or the weather, there is something more to aim at than mere description, however accurate and however interesting it may be in itself.

What we aim at always, in science, is explanation. Of course we cannot explain unless we correctly know the facts that we are trying to explain, and so description must always come first. Long ago, before men understood the nature of science, they used to try to explain before they went to Nature for the facts, and, of course, their explanations were always wrong and worse than useless. We know now that in every science correct description must come first, but we have to beware of another kind of mistake, which is that of fancying that we have explained a thing when we have correctly described it. The mind always has a tendency to stop and be content in science, until it learns that there is really no stopping-place, and that even a true explanation requires explanation—that is to say, behind all causes there are further causes still. Now, let us apply this to the study of the stars.

We look at the heavens during the brief moments we call our lives; or, indeed, we may say that mankind looks at the heavens during the little space of the life of mankind; and we desire not merely to see, but to understand. It is not enough to know that such and such things are in such and such places; we want to know how they came into existence, unthinkable ages before the birth of mankind or the making of the earth, and what will become of them after we ourselves are dead, and after the earth itself, perhaps, has passed away. We want to know not merely what is there, but what is happening there. Now, let us very clearly understand that though the eye, the telescope, and the camera have done great things for astronomy, and will yet do more, it is not in their power to answer the questions which the mind is bound to ask.

THE WONDERFUL INSTRUMENTS THAT HELP TO EXTEND MAN'S KNOWLEDGE

Little more than half a century ago it seemed that there must be a limit to the advance of astronomy, No one could even begin to imagine any possible way of making further progress, except in improving what had already been done, making bigger telescopes and better cameras. But as for knowing what the stars were made of, or getting any idea of what was happening in them, there seemed to be no way in which such knowledge could ever be attained; and one of the greatest of thinkers of that time, who died something more than half a century ago, declared that man could never know the composition of the stars.

Then there came to the aid of astronomy a new instrument, the spectroscope which, like the others, is in itself an instrument of description. But the description is altogether of a new kind, and, unlike the other, it goes a good way towards providing us with the beginnings of real explanation. It tells us something of the history of the stars and of their destiny. As yet we have only begun the study of what has been called the "new astronomy," which directly depends upon the discovery and use of this instrument. I want particularly to insist on this point, because it has a lesson which is true of every kind of knowledge. All knowledge depends upon methods and instruments. Every method and every instrument has certain possibilities, but it also has certain limits. And it is not until a new method, or a new instrument, is employed that a new stage begins in the history of that branch of knowledge. Thus the invention of the telescope and of the microscope—which are in themselves only arrangements of pieces of glass—marked great epochs in the history of knowledge.

HOW THE SPECTROSCOPE SHOWS US THE REAL COLORS THAT ARE IN THE STARS

The same is true also of the spectroscope, which is only an arrangement of pieces of glass. Now, *scope* means see, *micro* means little, *tele* means at a distance, *stereo* means solid. What does *spectro* mean?

When white light passes through a piece of glass that is not flat on both sides, it is broken up into the various colors of which it is made. So a ray of sunlight passing through a prism is broken up into a band of color, which is called a spectrum. Now, a spectroscope is simply an instrument which shows the spectrum of any kind of light that passes into it. A little spectroscope can easily be carried in the waistcoat pocket, and you may hold it up to a flame or to the fire or to the electric light, or to any kind of colored liquid, and then you see at once a band of color, which is the spectrum of the particular kind of light you are looking at. This spectrum can be studied, piece by piece, or analysed, as we say, and so the study of spectra is called *spectrum analysis*.

THE NEW FIELD OF KNOWLEDGE OPENED UP BY THE SPECTROSCOPE

By this little instrument a whole new world of discovery is opened. No sooner do we put it to the eye, and turn it upon anything from which light proceeds, than we learn that everything which gives out light gives out light of a particular kind, or, as we say, has its own spectrum. Every chemical element, for instance, if made to give out light, is found to give out light which shows a different spectrum from that of any other element. So you can turn the spectroscope on to a gas-flame, for instance, and say at once, by looking at the band which is spread out before the eye, whether there is sodium there, or carbon, or hydrogen, or potassium, or radium, as the case may be. Now if you can do this to a gas-flame, you can do it to the sun or to a star, and this means that the key to the composition of the stars is in our hands. If you take a pinch of salt and let some of it drop into the flame of a lamp or the gas, a brilliant yellow color will at once appear. It is so unmistakable that the eye alone can recognize it. But if you are looking at the flame through a spectroscope, you will instantly see the spectrum of sodium appear, and so you know for certain that there is glowing sodium in that flame.

HOW WE CAN TELL WHAT THE STARS ARE MADE OF FROM THEIR COLORS

Now, this is very interesting indeed, and it means that sodium can be detected by the spectroscope in exceedingly tiny quantities when the unassisted eye would tell us nothing. By exactly the same process, turning the telescope to the sun, or to a star or a comet, and applying the spectroscope, it is possible to say "There is sodium there." To-day a great part of all astronomical study is concerned with the spectrum analysis of the sun, the planets, and the stars, and the results are simply tremendous. Here, of course, we can only learn the principal things which they teach us.

First, we learn from spectrum analysis something which no one could well have expected. We readily understand how the telescope and the camera can teach us something of the movements of the stars; but, if we think we shall see that the only kind of movement which they can show for us is a movement *across* the sky. But suppose that a star be moving *through* the sky in our line of vision, whether from us or towards us, and no matter at what speed, then the telescope can tell us nothing.

THE MOVEMENT OF THE STARS THROUGH THE VASTNESS OF SPACE

No doubt in the course of long years it would record a difference in the brightness of the star, but we should have no way of knowing whether this was due to something happening in the star or to its movement. Now, the spectroscope has actually provided us with a means of discovering the movement, and even the rate of movement, of stars which are moving in our line of sight. The results thus obtained, added to our knowledge of star movements obtained by the telescope, are beginning to give us the outlines of what is happening in the world of stars, so far as movement is concerned. But first we must notice the beautiful way in which the spectroscope helps us here.

If we are standing at a railway station, and listen to the sound of a moving train, we notice that the engine's whistle rises in pitch if the train is approaching us, and falls if the train is going away. The pitch of the note depends on the number of waves that reach our ears every second. If the train is approaching us, it crowds these waves upon one another, so that more of them reach our ear in a given time, and the pitch of the note rises. If the train is going away, of course the intervals between the waves are dragged out a little, and so the pitch of the note falls. The discovery of this principle was first made as regards sound, but it is true of light also. Instead of the railway train and the engine's whistle sending out waves of sound, let us think of a star sending out waves of light. Now, if the star is moving in our line of vision, the waves will be crowded upon one another, or dragged out, according to whether the star is moving towards us, or from us.

DO THE STARS MOVE IN STRAIGHT LINES OR ALONG A CURVED PATH?

By spectrum analysis we are able to detect the changes in the light of the star, and we can thus accomplish the feat which it was declared could never be accomplished by man — that of discovering the motion of the stars in our line of vision.

Thus, by means of the telescope and the spectroscope, we are now beginning to learn a great deal about the movement of the stars which used to be called fixed, and everyone must wish to know whether any general truths can be discovered about the movements of the stars. For instance, is there a centre of the universe, perhaps occupied by a mighty star, around which all the other stars are revolving, like planets round a sun? This has often been supposed. We have no evidence of it, however, but we have evidence, rather, of something quite different. Then, again, we know in the case of the earth, and the other planets and the comets, that the motions of heavenly bodies are in circular or elliptical paths, not onwards in straight lines for ever. It is natural to ask, therefore, whether the stars move in similar paths, or whether they dash on in straight lines. So far as the evidence goes at present, we cannot detect a curved path to any star; but it must be remembered that our knowledge of star motions is very young, and that if stars moved in curves, those curves would doubtless be very enormous, so that it might perhaps need centuries of observation to show that a star's path was really curved, and not a straight line.

Another question that has to be asked is about the motion of the Milky Way. This, we know, is a mighty belt of stars, somewhere in the middle of which our sun is placed. To the eye, of course, the belt looks equally distant at any part, and, though we cannot be quite sure yet, the Milky Way is probably not far from being a circle. We know something of the proper motions, as they are called, of many of the stars in the Milky Way; but what we should like to know is whether this mighty belt, as a whole, is spinning. No one can yet say.

ARE THERE TWO GREAT WORLDS OF STARS RUSHING THROUGH EACH OTHER?

For years past, however, a famous German astronomer has devoted himself to the study of the movements of the stars, and more lately he has been followed by an English astronomer working at Greenwich, and these students are beginning to show that, in all probability, the movements of the stars reveal something never suspected before.

In the first place, the movements of the stars are not entirely helter-skelter, even allowing for the movement of the sun and of our earth with him, which is, of course, sufficient in itself to give us the impression that the stars are drifting in a particular direction. Even fully allowing for this, it is plain that there are definite tendencies in the star movements, and we learn that these movements form, as a whole, two great drifts, which are moving in opposite directions to each other. One drift is moving considerably faster than the other, but both are moving. To one of these drifts, it seems, our sun belongs. It looks, then, as if there were two sets, or systems, of stars in the heavens.

This is a startling idea — that the stars which we see in the heavens really belong to two systems, which may even at one time have been far apart from each other in space, but which have met, and are now rushing through and past each other. How many more such systems there may be in infinite space, no one knows.

WHAT WE ARE LEARNING FROM THE STUDY OF THE CHEMISTRY OF THE STARS

Of course, it need hardly be said that astronomers all over the world are keenly studying this theory of Professor Kapteyn's, and what we now know of the movements of the stars will appear scarcely more than a few scattered trifles of knowledge in twenty or thirty years. But, at least, we are for ever past the old idea which was expressed in the phrase "fixed stars."

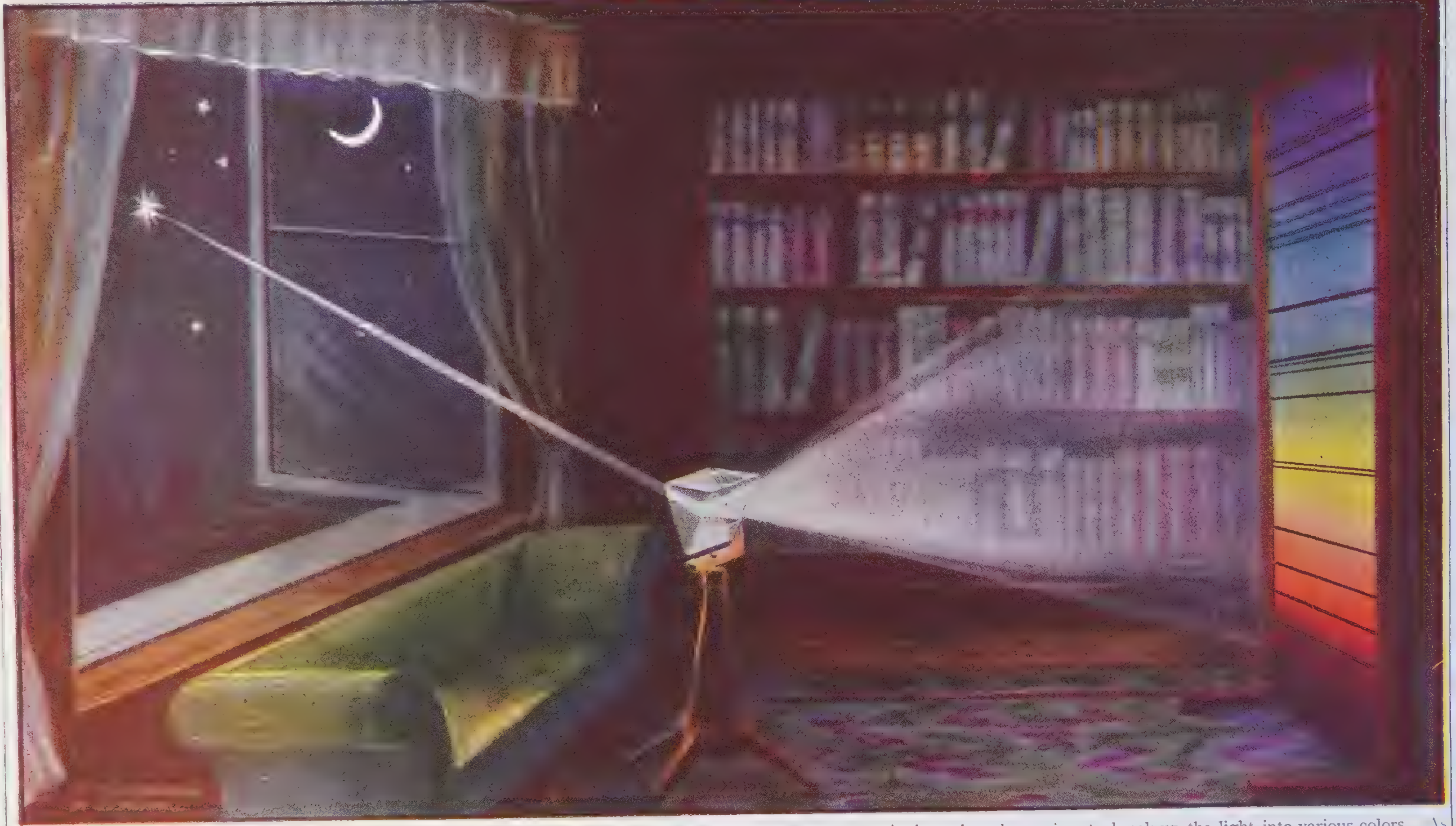
The contributions of the spectroscope to our knowledge of star motions have been very valuable, and no other means that we can imagine could have done for us what it has done. Yet they are quite the least part of what the spectroscope has taught us, for, as we have already hinted, it has created an entirely new field of knowledge — the chemistry of the stars. The study of star chemistry, like that of star motions, is still in its infancy, and in the main it is still a matter of description, but we are beginning to be able to explain also.

The first great result of the study of star chemistry is that everywhere throughout space, so far as we can see, the heavenly bodies are made of the same elements as those we find upon the surface of the earth.

THE STARS ARE MADE OF THE SAME ELEMENTS AS THE EYE THAT SEES THEM

The features that we find in the spectrum of sodium or oxygen, when these are made to glow, we find in the spectrum of the sun and of many stars, and no one will question our right to conclude that the same effects are produced by the same causes, and that, therefore, sodium, oxygen, carbon, and so forth, are to be found in the stars. Not only so, but, with scarcely an exception, we find in the spectrum of the stars no features we cannot refer to elements already known. The meaning of all this, not only for science in the narrow sense of the word, but for knowledge

HOW THE STAR-LIGHT TELLS US OF WHAT THE STARS ARE MADE



This picture shows us how the spectroscope is used to enable men to catch the light of a star, and by passing it through a glass prism to break up the light into various colors. As different metals give off different colors, we can in this way tell of what the stars are made. This picture does not show the whole spectroscope, but illustrates the principle.

itself, is stupendous. The very elements that make up the eye of the astronomer, or of the child who reads these words, can be practically seen glowing in the surface of a star so remote that perhaps it is thousands of years since the light by which we study it left the star. Throughout these enormous distances of space, in every direction we gaze, and in every variety of star, we find clear proof of the existence of the very same kinds of atoms as those we are breathing now, of which earth, air, and sea are made. Thus, if we never before had the right to use the word universe, we surely have it now, when the spectroscope teaches us that the very elements of which our own bodies are made are glowing in the farthest star, or were glowing when the light from that star left it.

No other revelation of the spectroscope could be more tremendous or have more meaning than this has ; but by its aid we have already learnt much more. We do not find that the spectrum of one star is the same as that of another. On the contrary, we find that the stars can be classified according to their spectra, and this classification helps us to proceed from description to explanation, because it tells us something of star history.

THE THREE KINDS OF STARS THAT TEACH US SOMETHING OF STAR HISTORY

It seems that we may roughly divide the stars into three groups, according to their spectra, and no one will doubt that this way of classifying them is much more important than classifying them by brightness, as we usually do. In the first and hottest class, we find proof of the existence of large quantities of hydrogen and other gases. These have been called the *gaseous stars.* The second group is cooler, and these have been called the *metallic stars,* because they yield evidence of the existence of metals, such as calcium, magnesium, copper, iron, and many others. The third group of stars is cooler still, and these are sometimes called the *carbon stars,* because carbon is so conspicuous in them.

Now, we have already learned enough to teach us that these results mean something regarding the history of the stars. Long ago it would have been supposed that the different kinds of stars were made as they are, and have always been as they are, just as it was supposed that the elements, and the different kinds of living creatures on the earth, were made in the beginning as they are now. Nowadays, however, we have come to understand the great idea of evolution, which teaches us that things develop or evolve from one another.

CHANGES IN STARS THAT TAKE LONGER THAN THE LIFE OF MANKIND

It is much more than probable that the different kinds of stars which we can recognize illustrate for us different stages in the history of any star—stages which take such a tremendous time that no doubt the whole past life of mankind would not be sufficient time in which to notice any change in any one star. We believe that the hottest stars are the youngest, and that gradually, as a star cools, its chemical composition changes and the metals appear. Then carbon becomes the most conspicuous element.

Then, as we believe, the star cools still farther, until it loses its light. After that stage we can no longer study it by the spectroscope, for there is nothing for the spectroscope to examine. We can no longer see it at all ; we can only learn something about it either because it eclipses a bright star, or because by gravitation it affects the movements of a bright star. It seems likely that the bright stage of a star is much the shortest, and that, after a brilliant youth, the star settles down to a long period of darkness.

Of course, we must ask where the hot, white hydrogen stars come from. If our account of stars is to be at all satisfactory, we should be able to trace out a way by which the dark, cold star may become a hot one again.

DO THE STARS DIE OUT AND BECOME STARS AGAIN ?

It is not as if the skies gave evidence that things are running down and coming to an end. On the contrary, the skies contain stars in every stage of a star's history, and there is no more evidence, on the whole, of ending than there is of beginning. Somehow or other, dark stars must be capable of starting again, and the question is how. We shall find the key to the answer when we study the nebulæ. We may learn, perhaps, that though they are not stars now, they were stars once, and may be stars again.

THE NEXT PART OF THIS IS ON PAGE 2843.

THE FROLIC OF JOHNNY THE STOUT

HO! FOR A FROLIC!

"HO! for a frolic!"
Said Johnny the stout;
"There's coasting and sledding—
I'm going out!"

Scarcely had Johnny
Plunged in the snow,
When there came a complaint
Up from his toe.

"We're cold," said the toe,
"I and the rest;
There are ten of us freezing—
Standing abreast."

Then up spoke an ear:
"My! but it's labour—
Playing in winter. Eh,
Opposite neighbour?"

"Pooh!" said his nose,
Angry and red;
"Who wants to tingle?
Go home to bed!"

Eight little fingers,
Four to a thumb,
All cried together—
"Johnny, we're numb!"

But Johnny the stout
Wouldn't listen a minute;
Never a snow-bank
But Johnny was in it.

Tumbling and jumping,
Shouting with glee,
Wading the snow-drifts
Up to his knee.

Soon he forgot them,
Fingers and toes—
Never once heeded
The ear and the nose.

Ah, what a frolic!
All in a glow,
Johnny grew warmer
Out in the snow.

Often his breathing
Came with a joke:
"Blaze away, Johnny!
I'll do the smoke."

"And I'll do the fire,"
Said Johnny the bold;
"Fun is the fuel
For driving off cold."

THE BALLAD OF AGINCOURT

On page 1874 we read that charming fairy poem "The Arming of Pigwiggen," by Michael Drayton, one of the famous Elizabethan poets. Here we have one of his spirited ballads, in which, with quick and graphic touch, he describes the battle of Agincourt, where the English army, led by King Henry V., won a great victory over the French after a closely contested battle, in which some 10,000 soldiers were killed. We read about the battle in the Book of Countries on page 774.

CONTINUED FROM 2664

FAIR stood the wind
for France,
When we our sails advance,
Nor now to prove our chance
Longer will tarry;
But putting to the main,
At Caux, the mouth of Seine,
With all his martial train,
Landed King Harry.

And taking many a fort,
Furnished in warlike sort,
Marched tow'rds Agincourt
In happy hour;
Skirmishing day by day
With those that stopped his way
Where the French gen'ral lay
With all his power.

Which in his height of pride,
King Henry to deride,
His ransom to provide
To the king sending;
Which he neglects the while,
As from a nation vile,
Yet, with an angry smile,
Their fall portending.

And turning to his men,
Quoth our brave Henry then:
"Though they to one be ten,
Be not amazed;
Yet have we well begun,
Battles so bravely won
Have ever to the sun
By fame been raisèd.

"And for myself," quoth he,
"This my full rest shall be:
England ne'er mourn for me,
Nor more esteem me:

KING HENRY V

Victor I will remain,
Or on this earth lie slain;
Never shall she sustain
Loss to redeem me.

"Poitiers and Cressy tell,
When most their pride did swell,
Under our swords they fell:
No less our skill is
Than when our grandsire great,
Claiming the regal seat,
By many a warlike feat
Lopped the French lilies.'

The Duke of York so dread
The eager vaward led;
With the main Henry sped
Amongst his henchmen.
Excester had the rear,
A braver man not there:
O Lord, how hot they were
On the false Frenchmen!

They now to fight are gone;
Armour on armour shone;
Drum now to drum did groan,
To hear was wonder;
That with the cries they make
The very earth did shake;
Trumpet to trumpet spake,
Thunder to thunder.

Well it thine age became,
O noble Erpingham,
Which did the signal aim
To our hid forces!
When, from a meadow by,
Like a storm suddenly,
The English archery
Struck the French horses.

With Spanish yew so strong,
Arrows a cloth-yard long,
That like to serpents stung,
Piercing the weather;
None from his fellow starts,
But playing manly parts,
And like true English hearts,
Stuck close together.

When down their bows they threw,
And forth their bilbows drew,
And on the French they flew,
Not one was tardy:
Arms were from shoulders sent;
Scalps to the teeth were rent;
Down the French peasants went;
Our men were hardy.

This while our noble king,
His broadsword brandishing,
Down the French host did ding,
As to o'erwhelm it;
And many a deep wound rent
His arms with blood besprent,
And many a cruel dent,
Bruisèd his helmet.

Glo'ster, that duke so good,
Next of the royal blood,
For famous England stood,
With his brave brother
Clarence, in steel so bright,
Though but a maiden knight,
Yet in that furious fight
Scarce such another.

Warwick in blood did wade;
Oxford the foe invade,
And cruel slaughter made,
Still as they ran up.
Suffolk his axe did ply;
Beaumont and Willoughby
Bare them right doughtily,
Ferrers and Fanhope.

Upon Saint Crispin's day
Fought was this noble fray,
Which fame did not delay
To England to carry.
O, when shall Englishmen
With such acts fill a pen,
Or England breed again
Such a King Harry?

TO A NIGHTINGALE: A GREAT POEM BY JOHN KEATS

John Keats was one of the great English poets, and no matter how small a selection of the great poems in our language we had to choose, we could not avoid including one or two by Keats, as he wrote at least six which we must place among the finest poems ever written. That given here is one of his masterpieces. It contains a number of allusions to the mythology or fables of ancient Greece, for Keats was steeped in that ancient lore we call "classical," and as a poet he was really more inspired and quickened by the spirit of old Greece than by that of his own time.

My heart aches and a drowsy numbness pains
My sense, as though of hemlock I had drunk,
Or emptied some dull opiate to the drains
One minute past, and Lethe-wards had sunk:
'Tis not through envy of thy happy lot,
But being too happy in thy happiness—
That thou, light-wingèd Dryad of the trees,
In some melodious plot
Of beechen green, and shadows numberless,
Singest of summer in full-throated ease.

O, for a draught of vintage! that hath been
Cool'd a long age in the deep-delved earth,
Tasting of Flora and the country green,
Dance, and Provençal song, and sunburnt mirth!
O, for a beaker full of the warm South,
Full of the true, the blushful Hippocrene,
With beaded bubbles winking at the brim
And purple-stainèd mouth;
That I might drink and leave the world unseen,
And with thee fade away into the forest dim:

Fade far away, dissolve, and quite forget
What thou among the leaves hast never known,
The weariness, the fever, and the fret
Here, where men sit and hear each other groan;
Where palsy shakes a few, sad, last grey hairs,
Where youth grows pale, and spectre-thin, and dies;
Where but to think is to be full of sorrow
And leaden-eyed despairs,
Where beauty cannot keep her lustrous eyes
Or new Love pine at them beyond to-morrow.

Away! Away! For I will fly to thee,
Not charioted by Bacchus and his pards,
But on the viewless wings of Poesy,
Though the dull brain perplexes and retards.
Already with thee! tender is the night,
And haply the Queen-Moon is on her throne,
Cluster'd around by all her starry Fays;
But here there is no light,
Save what from heaven is with the breezes blown
Through verdurous glooms and winding mossy ways.

I cannot see what flowers are at my feet,
Nor what soft incense hangs upon the boughs,
But in embalmèd darkness, guess each sweet
Wherewith the seasonable month endows
The grass, the thicket, and the fruit-tree wild;
White hawthorn and the pastoral eglantine;
Fast fading violets cover'd up in leaves;
And mid-May's eldest child,
The coming musk-rose, full of dewy wine,
The murmurous haunt of flies on summer eves.

Darkling I listen; and, for many a time
I have been half in love with easeful Death,
Call'd him soft names in many a musèd rhyme,
To take into the air my quiet breath;
Now more than ever seems it rich to die,
To cease upon the midnight with no pain,
While thou art pouring forth thy soul abroad
In such an ecstasy!
Still wouldst thou sing, and I have ears in vain—
To thy high requiem become a sod.

Thou wast not born for death, immortal Bird!
No hungry generations tread thee down;
The voice I hear this passing night was heard
In ancient days by emperor and clown:
Perhaps the self-same song that found a path
Through the sad heart of Ruth, when, sick for home,
She stood in tears amid the alien corn;
The same that oft-times hath
Charm'd magic casements, opening on the foam
Of perilous seas, in faery lands forlorn.

Forlorn! The very word is like a bell
To toll me back from thee to my sole self!
Adieu! the fancy cannot cheat so well
As she is fam'd to do, deceiving elf.
Adieu! adieu! thy plaintive anthem fades
Past the near meadows, over the still stream,
Up the hill-side; and now 'tis buried deep
In the next valley-glades:
Was it a vision, or a waking dream?
Fled is that music: Do I wake or sleep?

TRUE GREATNESS

The writer of this fine poem was Lady Elizabeth Carew, or Carey, who lived in the early years of the seventeenth century, and was the author of a tragedy entitled "Marian, the Fair Queen of Jewry," which was performed in London in the year 1613. She was a relative, on her mother's side, of the great poet Edmund Spenser, and died in the year 1635. The word "seld" in the last verse is, of course, the same as "seldom," but even a poet would now hesitate to use the word, though our language has not changed greatly since the time of Elizabeth, when "modern English" was established.

THE fairest action of our human life
Is scorning to revenge an injury:
For who forgives without a further strife
His adversary's heart to him doth tie:
And 'tis a firmer conquest truly said
To win the heart, than overthrow the head.

If we a worthy enemy do find,
To yield to worth, it must be nobly done:—
But if of baser metal be his mind,
In base revenge there is no honour won.
Who would a worthy courage overthrow?
And who would wrestle with a worthless foe?

We say our hearts are great, and cannot yield;
Because they cannot yield, it proves them poor:
Great hearts are task'd beyond their power but seld:
The weakest lion will the loudest roar.
Truth's school for certain does this same allow,
High-heartedness doth sometimes teach to bow.

* DOBBIN'S FRIEND

In these pleasing rhymes the late Mary Mapes Dodge, several of whose poems we have already read, describes with the charm of simplicity and natural feeling the familiar picture of a kitten as stable companion to a horse. Taken from "Rhymes and Jingles," by permission of Messrs. Scribner's Sons.

DOBBIN has a little friend,
Spotted white and sable;
Every day she goes to him,
In his lonely stable.

Not a mite of dread has she,
Not a thought of danger;
Lightly runs between his hoofs,
Jumps upon his manger;

Lays her soft, warm cheek to his,
Purrs her meek "Good-morning!"
Gives the flies that hover near,
Such a look of warning!

"Dobbin, dear," she sometimes says,
"Feel my winter mittens;
Nice and warm, you see, and made
Purposely for kittens.

"Dobbin, dear, such times at home!
Mother has caught a rat!
Brought it home to show to us—
What do you think of that?"

"Dobbin!" she whispers, purring still,
"You often get so weary,
Why don't you balk or run away,
And get your freedom, dearie?"

Then Dobbin gives his head a toss,
And says: "For shame, Miss Kitty,
If I could do so mean a thing,
'Twould be a monstrous pity;

"No, no; my master's good and kind;
I'll never vex him, never!"
And pussy, pleased, still rubs his cheek,
And likes him more than ever.

THINGS THAT NEVER DIE

Miss Sarah Doudney is an English writer well known for her many excellent stories for grown-ups as well as her books for girls. She has also written poetry, and these verses of hers are worthy of inclusion in our BOOK OF POETRY.

THE pure, the bright, the beautiful,
That stirred our hearts in youth,
The impulse to a wordless prayer,
The dreams of love and truth;
The longings after something lost,
The spirit's yearning cry,
The strivings after better hopes—
These things can never die.

The timid hand stretched forth to aid
A brother in his need,
The kindly word in grief's dark hour
That proves a friend indeed;
The plea for mercy gently breathed
When justice threatens high,
The sorrow of a contrite heart—
These things shall never die.

The memory of a clasping hand,
The pressure of a kiss,
And all the trifles, sweet and frail,
That make up love's first bliss;
If with a firm unchanging faith,
And holy trust on high,
Those hands have clasped, those lips have met—
These things shall never die.

The cruel and the bitter word
That wounded as it fell;
The chilling want of sympathy
We feel but never tell;
The hard repulse that grieves the heart
Whose hopes were bounding high
In an unfading record kept—
These things shall never die.

Let nothing pass, for every hand
Must find some work to do;
Lose not a chance to waken love—
Be firm, and just, and true:
So shall a light that cannot fade
Beam on thee from on high,
And angel voices say to thee—
"These things shall never die."

ONLY A BABY SMALL

The author of these familiar and pretty lines, the last four of which are very frequently quoted, was named Matthias Barr.

ONLY a baby small,
Dropped from the skies;
Only a laughing face,
Two sunny eyes.

Only two cherry lips,
One chubby nose;
Only two little hands,
Ten little toes.

Only a golden head,
Curly and soft;
Only a tongue that wags
Loudly and oft.

Only a little brain,
Empty of thought;
Only a little heart,
Troubled with naught.

Only a tender flower
Sent us to rear;
Only a life to love
While we are here.

Only a baby small
Never at rest;
Small, but how dear to us,
God knoweth best.

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* From "Rhymes and Jingles," copyright, 1874, 1904, by Charles Scribner's Sons.

WHAT THE STARS HAVE SEEN

Oliver Wendell Holmes was an American physician; born at Cambridge, Massachusetts, August 29, 1809, and died at Boston, October 7, 1894. He achieved world-wide fame as a writer both of prose and verse, and during his long life wrote many books, which are all lighted up with the sun of humor and tender feeling. In these verses he pictures the stars above us as the everlasting silent watchers of what takes place in this world of ours. It is a quaint and humorous fancy, and, of course, is not to be regarded as serious poetry.

WHEN Eve had led her lord away,
And Cain had killed his brother,
The stars and flowers, the poets say,
Agreed with one another

To cheat the cunning tempter's art,
And teach the race its duty,
By keeping on its wicked heart
Their eyes of light and beauty.

A million sleepless lids, they say,
Will be at least a warning;
And so the flowers would watch by day,
The stars from eve to morning.

On hill and prairie, field and lawn,
Their dewy eyes upturning,
The flowers still watch from reddening dawn
Till Western skies are burning.

Alas! each hour of daylight tells
A tale of shame so crushing,
That some turn white as sea-bleached shells,
And some are always blushing.

But when the patient stars look down
On all their light discovers,
The traitor's smile, the murderer's frown,
The lips of lying lovers,

They try to shut their saddening eyes,
And in the vain endeavour
We see them twinkling in the skies,
And so they wink for ever.

THE DISCONTENTED APPLES

Mr. Frederic E. Weatherly is the author of this light and amusing little poem, which is not without a serious lesson that may be laid to heart by discontented young folk.

HE was an apple and she was an apple,
And they hung on an old brown tree;
And a fonder little couple
I trow you never would see.

But, alas! this little couple
They could not contented be;
"I should like to travel," she whispered,
"I wish that we could," said he.

But the summer went by so quickly,
And they still hung there on the tree:
For people can't always travel,
And apples are apples, you see.
And they sighed, and they groaned, and grumbled
At the home that they once loved well;
Till there came a great wind through the orchard,
And down on the ground they fell.

"Oh, dear, what a bump!" she whispered,
"I'm bruised all over," said he;
But if people at home won't tarry,
They must get a few bumps, you see.

Then they found themselves put in a basket.
"We're off to the world," said she;
"I wish we were back in the orchard,
If this is the world," said he.

And this poor little couple
Were put in a dark big pie;
"Oh, love," sighed the wife to her husband,
"I think we are going to die."
And the oven grew hotter and hotter.
And they died, with a dream of home;
"Why didn't we stay in the orchard?
Oh, why did we want to roam?"

WILLIE'S LODGER*

It is often said that in each of us there are really two characters, a good and a bad one. Mary Mapes Dodge, the American writer, in this clever children's poem takes this idea for her subject, and the result is an excellent lesson in how to guard against the worse of our two characters getting the upper hand. The verses are reprinted from "Rhymes and Jingles," by permission of Messrs. Chas. Scribner's Sons.

TWO little boys named Willie
Live in the house with me.
One is as good a darling
As ever I wish to see;
His eyes are glad, his smile is sweet,
His voice is kind, his dress is neat,
And he is the boy for me.

This Willie says: "Good-morning!"
Happy as any bird;
A merrier laugh, a lighter step,
No mortal ever heard.
"Thank you," he says, and "If you please?"
He will not pout, he will not tease—
Oh, he is the boy for me!

The other Willie, sad to say,
Is very, very bad;
I think he is as cross a child
As ever a mother had.
"Go 'way!" he shrieks. He squalls and cries,
The angry tears oft fill his eyes—
He is not the boy for me.

He lingers round my Willie,
And whispers evil things—
Oh, how we dread him! for we know
The sin and grief he brings!
Who keeps him, then? Why, Willie's self;
He keeps this wicked Willie-elf
Who is not the boy for me.

If I were you, my Willie,
I'd make him stay away—
This boy who grieves your mother
And spoils your brightest day,
For he lives in you where he doesn't belong;
So oust him, Willie! Send him along!
"Clear out!" I'd say, "old Fume and Fret!
This heart of mine is not to let—
You're not the boy for me."

WHAT MIGHT HAVE BEEN

In these amusing verses, by Mr. Frederic E. Weatherly we have the reverse of the state of mind described by the same writer in "The Discontented Apples," on this page, and all will agree that the contentment of which he sings here is much better than the discontent of the apples.

THE little birds are singing
Above their speckled eggs,
The daddy-long-legs talks about
His children's lovely legs;

The red cow thinks her little calf
The best that there can be.
And my papa and my mamma
Are very proud of me!

And yet I might have been a bird
And slept within a nest,
Or been a daddy-long-legs,
With scarcely any chest;

Or been a little calf or pig,
And grown to beef or ham;
I'm very, very, very glad
That I am what I am!

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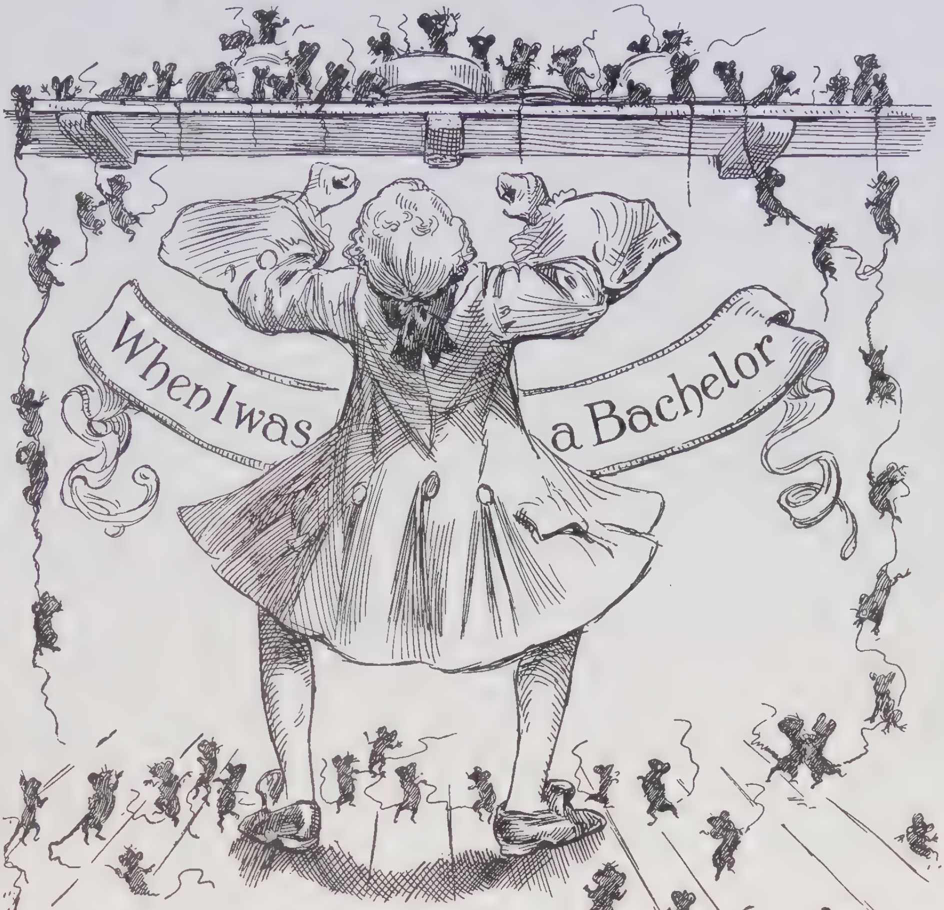
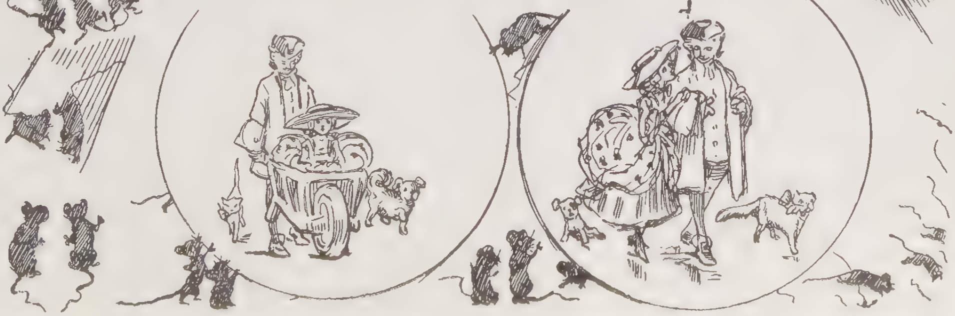


When I was a bachelor, I lived by myself,
And all the meat I got, I put upon a shelf;
The rats and the mice did lead me such a life,
That I went to London to get myself a wife.

The streets were so broad, and the lanes so narrow,
I could not get my wife home without a wheelbarrow;
The wheelbarrow broke, my wife got a fall,
Down tumbled wheelbarrow, little wife, and all.

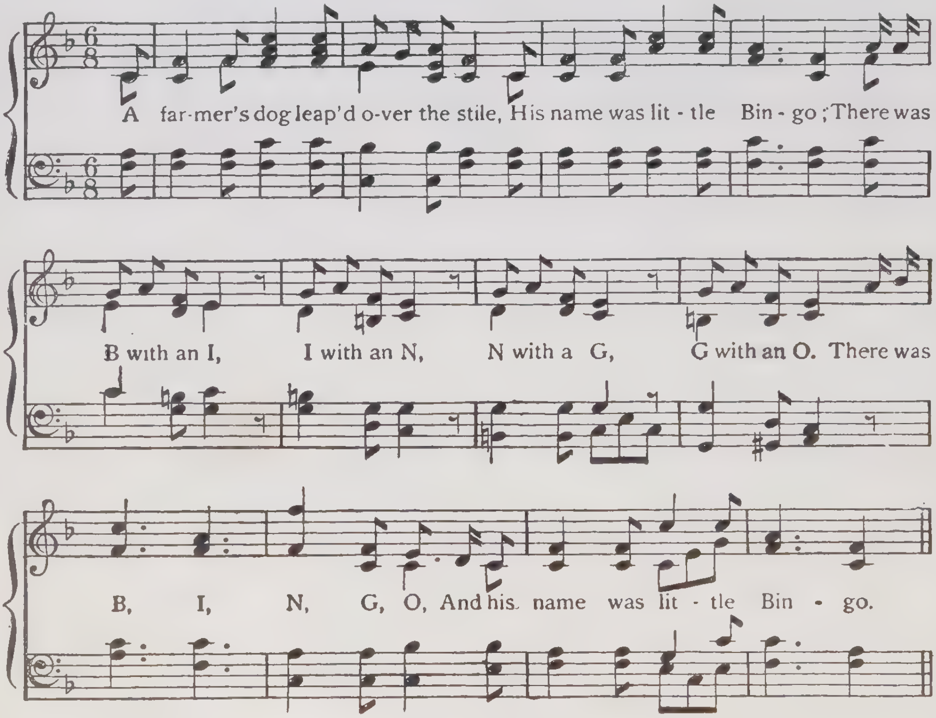


SOME little mice sat in a barn to spin;
Pussy came by, and she popped her head in.
"Shall I come in and cut off your threads?"
"Oh, no, kind sir; you will snap off our heads!"
"Oh, no, I'll not; I'll help you spin."
"That may be so; but you won't come in."

GOOD-MORROW to you, Valentine!
Curl your locks as I do mine;
Two before and three behind;
Good-morrow to you, Valentine!

I HAVE seen you, little mouse,
Running all about the house,
Through the hole, your little eye
In the wainscot, peeping sly,
Hoping soon some crumbs to steal,
To make quite a hearty meal.
Look before you venture out,
See if pussy is about,
If she's gone, you'll quickly run
To the larder for some fun,
Round about the dishes creep,
Taking into each a peep,
To choose the daintiest that's there,
Spoiling things, you do not care.

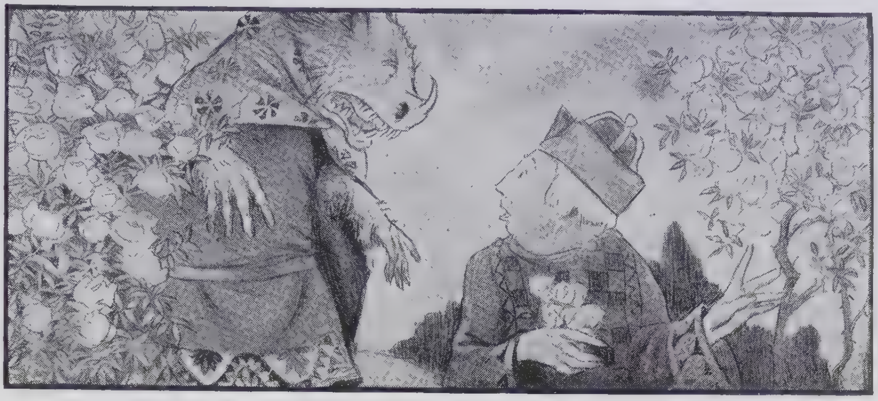
LITTLE BINGO


A far-mer's dog leap'd o-ver the stile, His name was lit - tle Bin - go; There was
B with an I, I with an N, N with a G, G with an O. There was
B, I, N, G, O, And his name was lit - tle Bin - go.

THE girl in the lane, that couldn't speak plain,
Cried gobble, gobble, gobble;
The man on the hill, that couldn't stand still,
Went hobble, hobble, hobble.

THERE was a little boy went into a field,
And lay down on some hay;
An owl came out and flew about,
And the little boy ran away.

LITTLE Betty Winkle she had a little pig,
It was a little pig, not very big;
When he was alive he lived in clover,
But now he's dead, and that's all over.
Johnny Winkle he
Sat down and cried;
Betty Winkle she
Lay down and died;
So there was an end of one, two, and three,
Johnny Winkle he,
Betty Winkle she,
And Piggy Wiggie!



BEAUTY AND THE BEAST

CONTINUED FROM 2636

A RICH merchant had three daughters. The two elder ones were cross and ugly, but the youngest daughter was so sweet and lovely that she was called Beauty. But the day came when the merchant lost nearly all his money. He had to sell his grand house and go to live with his daughters in a little cottage. He was too poor to keep any servants, but Beauty willingly undertook all the work of the house, and even tried to find excuses for her lazy sisters when they stayed in bed till quite late in the morning and allowed her to wait on them all day long.

One day, while the merchant worked in his garden, a letter was handed to him. He opened it, and learned that if he could go to a distant town he would be able to obtain work. Overjoyed at his good fortune, the merchant embraced his daughters, and prepared to set out.

" What shall I bring you when I return ? " he asked Beauty.

" I want a new dress," cried both the elder daughters before Beauty could answer.

" I will bring you the best that I can afford, my daughters," replied the merchant. " And you, Beauty, what would you have ? "

Beauty knew that it pained her father to feel that he no longer had the means to buy costly presents for his children, so she said quietly: "A rose, father, just a beautiful rose, if you can find one," thinking that such a present would cost him nothing.

So the merchant set out, and, after traveling for a whole day, reached the town to which he was journeying, and received his orders. The following day he prepared to return, but he had not gone far when, to his dismay, he discovered that he had taken the wrong turning. He was in the midst of a huge forest, and knew it was very unlikely that he would meet anybody of whom he could inquire his way.

After searching in vain for the right path for many hours, a terrible storm arose, and the merchant, in despair, climbed up into a tree in the hope of finding a light to guide him to some house. Sure enough, he saw a light, and, regaining the ground quickly, he leapt upon his horse and was soon before the gates of a magnificent castle.

For a moment he waited, but as nobody appeared he dismounted and strode up the steps. The house was brilliantly lighted from top to bottom and on every side were signs of wealth and luxury.

The merchant passed through the great hall, blazing with lights, and found himself in a large room. In the centre stood a table loaded with good things, and the merchant, being very hungry, sat down and ate a good meal. When he had finished, he began to feel very sleepy. Opening a door at the end of the room, the merchant found himself in a comfortable bedroom. He undressed and got into bed, and soon fell asleep.

In the morning, to his intense astonishment, he found a new suit of clothes in the place where he had left his old ones. He thought this strange, but he put them on and made his way to the dining-room, where he found breakfast awaiting him.

When he had finished an excellent meal, he rose and wandered out into the garden. The flowers were magnificent, and the sight of a lovely rose-tree reminded him of his youngest daughter's request. Stooping, he cut a lovely bud, and placed it in his coat. Just then he heard a noise, and, looking up, found himself face to face with the ugliest man he had ever seen, for though he had a man's body, the face was that of a beast.

The merchant shuddered.

" Ungrateful man ! " roared the Beast. " Did I not feed you when you were hungry, and shelter you for the night ? And yet you repay me by robbing me of my flowers. Ingratitude is a sin I cannot pardon ; in an hour from this time you must die ! "

" Forgive me, I pray you ! " cried the merchant, falling on his knees. " I did but pick a rose for my daughter, and could I have found you sooner, I would have thanked you for all your kindness."

After some pleading, the Beast consented to forgive the poor man if he would promise to send in his place the first living thing he saw on returning to his home ; and the merchant, hoping that this would be his dog, who always ran to welcome his master long before anyone else had heard his footsteps, gladly promised, and departed.

To his horror, his first sight as he drew near the house was Beauty.

" Oh, what a beautiful rose ! " she exclaimed, kissing him.

" Alas ! " replied the poor man sadly, " you little know how dear it has cost me." And drawing her to him, he led her inside and told her the whole story.

" What you will do when I am gone, my poor children," he concluded, " I do not know."

" But you are not going," declared Beauty bravely, " for I shall go instead." And in spite of everything that the merchant could say, Beauty insisted on having her own way.

And so the next day they both set out for the castle, where they found a splendid supper awaiting them. They sat down to eat, and had scarcely finished when the Beast appeared. He looked at Beauty, and Beauty lifted her eyes and saw him. She shuddered and moved closer to her father. " What a dreadful man ! " she was thinking. " I do hope he will kill me quickly."

But the Beast did not want to kill one so gentle, and he told her father that if he would go home and leave her behind, no harm should befall her.

So the merchant rode sadly away, and Beauty was left alone in the huge castle. But the Beast scarcely went near her all day, and when night came he showed her a beautiful little room, which he told her was hers. Sure enough, on the door was written " Beauty's Room," and inside was everything she could wish for. That night Beauty dreamed that a fairy came to her and bade her be not afraid, for she was quite safe.

The next morning she rose early and wandered through the gardens, but not one single person did she see. When she felt hungry she went to the dining-room, where she met the Beast.

" Do you think me very ugly ? " asked the Beast.

" Well—yes," replied Beauty.

He spoke so gently that she felt quite sorry for him.

The Beast sighed and left her. The next day she met him again.

" Will you marry me, Beauty ? " said the Beast.

" Oh, no, no, no ! " cried Beauty, for, much as she pitied him, she could not bear the thought of marrying him, and the Beast went away looking very unhappy.

Soon after this, Beauty looked into a magic glass, and saw that her father was very ill. The next time she met the Beast again she begged to be allowed to visit her home.

" If you go away, it will kill me," said the Beast ; " but rather than see you unhappy, I would bear any pain. Go, but you must return in a week."

At parting, the Beast gave her a magic ring, which would take her home and bring her back again when she wished to return, and Beauty was sur-

BEAUTY SAVES THE LIFE OF THE BEAST

" Oh, you must not die ! " cried Beauty. " I will marry you, dear Beast, for it is surely better to be kind and gentle than to have a handsome face." And as she spoke a wonderful change came over the Beast.

prized to find how sad the parting with the great, ugly creature made her.

Her father was so rejoiced to see his daughter alive and well that he quickly recovered, and Beauty was so happy to be at home again that she forgot all about her promise to the Beast. The week slipped by, and then another, until one night Beauty dreamed that the Beast was dead. She burst into tears and awoke. She dressed quickly, and with the aid of her ring was soon back again in her little room in the palace.

She ran out into the gardens, and there, in a swoon, by the fountain lay the Beast. Beauty threw some water upon his face, and presently he recovered. When he saw her, he smiled.

"I could not live without you," he said faintly, "and so I tried to starve myself to death."

"Oh, you must not die!" cried Beauty, wringing her hands. "I will marry you, dear Beast, indeed I will. It is surely better to be kind and gentle than to have a handsome face; and indeed I love you."

As she spoke a wonderful change came over the Beast, and even as she looked he was transformed into a handsome prince.

Beauty was so astonished that she could scarcely believe her eyes. Taking her hand, the young man explained that a wicked fairy had cast over him a spell, which could not be removed till some gentle girl should promise to marry him, ugly as he was.

Beauty's father was overjoyed to hear the good news, but the disagreeable sisters were as jealous as they could be, and said such unkind things to Beauty at the wedding that the Prince turned them into statues, and placed one at each side of the palace gates, where they stand, still and cold, to this day.

THE RIDDLE OF THE SPHINX

THERE was once a King of Thebes, in ancient Greece, of whom it was foretold that he would be killed by his own son. So, when a baby boy was born to him he had it carried far away to a wild forest, and left there to die. But it was all in vain. For Œdipus, as the child was called, was found in the forest by a herdsman, and taken to Corinth; and there he grew up, not knowing who was his real father. And one day he met the King of Thebes, and slew him as a foreign enemy.

Œdipus did not know what a great crime he had committed, and he was surprized to learn that the King of Thebes was dead, and that the crown was offered to any man who could manage to answer the riddle of the Sphinx.

The Sphinx was a strange monster that did great harm to the people. She had a woman's face, and the body and claws of a lioness, and she crouched on a hill near Thebes, waiting to kill all the men who should pass by, because none of them could answer her riddle. But Œdipus did not fear. He went boldly up to her, and said:

"What is your riddle?"

"This," said the Sphinx. "There is a wondrous creature, and its like is not found on earth, in air, or in water. At first it goes on four legs, then it goes on two, and at last it goes on three."

"Man!" cried Œdipus.

And so it was. In infancy man crawls on four legs, then he walks on two, and when he grows old he uses a stick as a sort of third leg. When her riddle was solved, the Sphinx cast herself from the hill, and died, and the grateful people of Thebes crowned Œdipus as their king.

But one day Œdipus discovered that he was really the son of the man he had killed. This made him very unhappy, and he gave up his throne and wandered blindly about the country dressed in beggarly rags. But he had a tender and loving daughter, and she went with him and helped him and comforted him.

NOUREDDIN AND THE WONDERFUL PERSIAN

WHEN the good Haroun Alraschid became Caliph of Bagdad, he made his cousin Zenebi, King of Balsora, and Zenebi then sought for a wife worthy to be his queen. He ordered his Minister to find for him a maiden perfect in charm and beauty, and excellent in wit and intelligence.

For a long time the Minister tried in vain to discover such a maiden, but one morning a merchant brought to his house a Persian slave-girl who was very lovely and possessed marvelous gifts. The Minister gave the maid a set of rooms in his house, and resolved to introduce her to the King. But in the course of the day Noureddin, the son of the Minister, saw her, and fell deeply in love with her. She returned his love, and when the Minister came to conduct her to the Royal palace, he found the two young people seated together, deep in talk with each other.

On seeing them thus he cried: "Oh, unhappy boy! you have ruined me. The King will find this out."

"Pardon us, pray, for falling asleep," said Noureddin, when the old man came and woke them up at evening.

But after struggling between his affection for his son and his duty to the King, the Minister gave way, and allowed Noureddin to marry the beautiful Persian. He then tried to keep the King quiet, by pointing out how hard it was to discover a maiden in whom great beauty and great wisdom were joined. But the King found out about the Persian maid, and sent his men to bring Noureddin and the maid to him.

Happily, a friend of Noureddin's heard the order, and hurried out and warned him, and Noureddin and the beautiful Persian at once fled from Balsora, and got on a ship sailing to Bagdad. But when they arrived at Bagdad they did not know where to stay, as they had never been in this famous city before, and after wandering about the crowded streets until they were weary, they entered a gate leading to a beautiful garden, and there sat down by a fountain, and fell asleep. At evening an old man came to the spot and woke them up.

"We pray you to pardon us for falling asleep here," said Noureddin. "We are strangers in Bagdad, and we walked about the city until we were quite tired out. This garden is really the most delightful spot that I have ever seen. Oh, what a happy man you are to possess it!"

Now, the garden was really one of the lovely pleasure-grounds of the great Caliph, and the old man was only one of the keepers. But he was so flattered at being taken for the owner of the place that he at once offered to show Noureddin and the lovely Persian slave all over the lordly pleasure-house that stood in the middle of the garden opposite the Royal palace. He led them up the wonderful golden staircase, and then into the great hall built of jasper, and adorned with the richest treasures of the kingdom. At the sight of all the splendor, Noureddin was filled with joy, and he gave the old man a handful of gold, saying:

"Do, please, allow me to provide a banquet this evening. Give this gold to one of your slaves, and get him to buy a supply of meats and fruits and wine."

The old man ran out into the streets and bought a rich repast, and returned with it to the pleasure-house, and Noureddin and the beautiful Persian lighted all the costly lamps by the eighty windows of the great hall, and then they sat down with the old man and his guests to feast.

Now, the Caliph of Bagdad had a good view of the pleasure-house from his palace, and he was much surprized to see lights shining in all the windows of the hall. Any other ruler would have sent some courtier to inquire into the matter, but Haroun Alraschid liked to see into things himself, so disguising himself as a beggar, he went into the garden, and crept up to the pleasure-house just as the beautiful Persian commenced to sing to the sound of a lute.

"What a sweet voice!" he said. "I must find a way to see this charming singer without making myself known."

As he was wondering what to do, he saw a man fishing in the river that ran through the garden, and asked:

"Have you caught any fish?"

"Two," replied the fisher; and the Caliph bought them, and entering the pleasure-house, he bowed low and said to Noureddin:

"I see you are holding a feast, and as I have just caught two fine fish, I have brought them in the hope that they will add to your pleasure."

"Very well," said Noureddin. "Go and fry them in the kitchen."

The Caliph did so, and soon returned with the fish, and served it to the merrymakers.

When Noureddin had eaten his portion, he gave Haroun Alraschid a handful of gold, and said:

"I have never tasted better fish. Pray accept this little gift as a small return."

The Caliph took the gold and thanked Noureddin, and said:

"Will you bestow an inestimable favor on me? Let me hear one song from the lips of the sweet singer at your side."

The beautiful Persian at once took up her lute and sang song after song, and the Caliph listened to her with exceeding delight. And in between the songs Noureddin related the story of their marriage and their flight.

Then Haroun told Noureddin who he was, and he sent a letter to King Zenebi commanding him to retire from the throne, and made Noureddin and the beautiful Persian, King and Queen of Balsora.

THE LUCK OF SIMPLE JACK

SIMPLE JACK was the best silk weaver in Spitalfields, but he had not the least idea of the value of money. If he went out with plenty of silver in his pocket, he was sure to spend it, either upon his friends, who used to crowd round him, or in buying very many things for himself and his wife that were of no use at all.

And not only did Simple Jack do this, but he would pay whatever the seller asked for any article; and, as the people all knew his weak points, Simple Jack was swindled whenever he went out to buy. He was just as silly if he wanted to sell, for then he would take whatever price was offered for his goods, no matter how absurdly low that price might be. So his wife used to do all the buying and selling that they needed.

But one day Simple Jack resolved to go a-marketing himself. He took a bundle of fine silks and sold them to a merchant for £40 ($200). Then, seeing a man with a donkey, he said:

"That donkey would be useful to me. Will you take forty pounds for it?"

Of course, the man readily sold it at this high price. But Simple Jack found that the donkey was very obstinate, and it would not go the way he wanted.

"How much will you give me for this stubborn beast?" he said to a costermonger.

"It would be dear at ten shillings," said the artful costermonger.

Simple Jack took the ten shillings, and with the money he bought a sack of new potatoes. But the sack was very heavy, and Jack soon grew tired of his new bargain. So he exchanged it at a fish shop for a mackerel. Naturally his wife was very angry when he told her how he had spent the forty pounds. But on cutting the fish open, she found in it a great pearl of remarkable beauty.

"Why, this must be worth thousands of pounds!" she cried.

"There you are, my dear!" said Simple Jack merrily. "I spend a beggarly forty pounds in buying a fish containing a rich jewel, and yet you say that I have no idea of the value of money."

THE CALIPH BROUGHT THE FISH TO THE FEAST

"I see you are holding a feast," said the Caliph to Noureddin, "and as I have just caught two fine fish, I thought I would bring them to you." "Very well," said Noureddin. "Go and fry them in the kitchen."

THE TREASURE OF THE POOR

THERE were once upon a time, according to a French story told by Jean Richepin, two very poor people who possessed nothing of anything. They had no bread to put in a bread-pan, and no bread-pan in which to put bread. They had no house in which to place a bread-pan, and no plot of ground on which to build a house. If they had possessed a plot of ground, they might have been able to find something wherewith to build a house. If they had possessed this house, they might have been able to place there a bread-pan. And if they had possessed this bread-pan, no doubt from time to time they would have been able to find a little bread to put in it.

But having neither field nor house, nor bread-pan nor bread, they were verily of the poor—very poor.

That which they most lacked was a little house of their own, where they could light a few dry sticks and sit over the blaze chatting together.

For the best thing in the world, better even than eating, is to possess four walls, without which a man is no more than a wandering animal.

These two poor people felt themselves poorer than ever one sad Christmas Eve.

As they were commiserating themselves on the great lonely high road in the black night, they stumbled upon a poor cat, who *mee-owed* to them.

This was truly a very poor cat, as poor as themselves, for it was nothing but skin and bone, and had scarcely any hairs on its skin.

If it had had some hairs on the skin, no doubt the skin would have been in a better state. If its skin had been in a better state, no doubt the cat would have been strong enough to catch mice, and would not have remained so dreadfully thin.

But not having any hairs, and with its poor skin on its bones, this was in truth a very poor cat.

The poor are kind to the poor, and help one another. These two poor people took the poor cat with them, and did not think of eating anything themselves, but gave to the cat a little lard which had been given to them in charity. The cat, having eaten, started off a little in front of the two poor people, and led them through the black night till they came to an old deserted hut.

There were two stools and a hearth in this hut, as they could see by a ray of moonlight, which shone and disappeared at the same time.

And the cat also disappeared with the moonlight.

So that they found themselves seated in darkness before a black hearth, which the absence of fire made still more black.

" Ah," said they, " if we only had a few embers! It is very cold! And what could be so pleasant as to sit warming ourselves over a bit of fire, telling stories? "

But there—there was no fire on the hearth because they were very poor people; in truth, of the poor, very poor.

All of a sudden there appeared two bright, glowing embers at the bottom of the chimney; two beautiful bits of fire—yellow, like gold.

And the old man clapped his hands joyously and said to his wife: " Do you feel how nice and hot it is? "

" I feel it," answered the old woman. And she spread her open palms over the fire. " Blow under them, and make them flare up," she said.

" No, no! " answered the man. " That would only burn them up quickly."

And so they began chatting to pass away the time, without sadness now, because they felt cheered up by the sight of two little yellow embers.

The poor are happy with very little, and these two rejoiced in seeing the beautiful present of fire which had come to them. Through the whole night they sat talking and warming themselves, quite certain now that the Child Christ wished them well; for these two shining embers remained mysteriously bright, and were never consumed.

And when morning came these two poor people, who had been quite warm and had been quite happy all night, saw at the bottom of the chimney the poor cat, who looked at them with its large yellow eyes.

And it was the reflection of its eyes which had kept these two poor people so warm and cheerful.

" The treasure of the poor is fancy," said the wise cat to them.

THE CAT LOOKED AT THEM WITH ITS YELLOW EYES

The two poor folk who had been kind to the cat, sat warming themselves all night by two glowing embers on the hearth, and only discovered in the morning that they were but the reflection of the cat's eyes.

LEGENDS OF PLACES AND THINGS

THE PIGEON AND THE MAGPIE

YOU must never keep saying "I know, I know," when anybody is telling you anything. For that was what the wood-pigeon kept saying to the magpie.

The wood-pigeon is a silly, careless bird. All he has for a nest is an untidy heap of twigs, raked together on a forked bough. There he sits and shivers in wintry weather, and you can then hear him singing in a very doleful way:

When all the world's in flower,
I'll build a bonny bower
For two.

But when the green leaves come out, and the fields are bright with blossom, he forgets how cold he felt in winter, and he sings joyfully:

Now all the world's in flower,
Who'd ever waste an hour
In building of a bower?
Who? Who?

One spring morning, however, the magpie took pity on him, and began to show him how to make a nice, warm, snug nest. But all the time the silly wood-pigeon, who did not know a thing about nest-making, kept on saying:

"I know, I know, I know!"

And at last the magpie got angry, and flew away, and said:

"Well, if you know so much, do it all yourself."

So the wood-pigeon still has only a few bits of twigs to make a nest for himself.

THE HERON, THE CAT, AND THE BRAMBLE BUSH

ONCE upon a time, and a very good time it was, though it was neither my time nor your time, nor anybody else's time, a heron, a cat, and a bramble bush found some fairy gold and bought a farm with it.

The heron took the hay as his share, and mowed it, and meant to carry it to market the next day. But in the night a storm came and blew the hay into the river, and it floated away. Ever since then the heron stands mournfully by the side of rivers and cries: "Pay me for my hay!"

The cat cut the oats and put them in a barn. But the storm drove all the rats and mice there for shelter, and they ate up all the oats. Ever since then the cat springs on every rat and mouse she sees, and cries: "Pay me for my oats!"

The bramble bush took the wheat, and harvested it, and carried it to market and sold it. Unhappily, the bramble bush sold on trust, and no one ever paid up. Ever since then the stupid bramble bush takes hold of everybody who passes by, and cries: "Pay me for my wheat! Pay me for my wheat!"

THE KING OF THE CATS

SOME years ago, two brothers lived in a lonely farm in a lonely part of Scotland, and the only creature they had to keep them company was a great black cat. One night the younger brother came home late, and said:

"I've just seen the strangest sight on earth. I lost my way on the hills, and came to a hollow tree with a light in it. I looked down the tree, and there was fairyland. A funeral was taking place, and a host of cats were following a little coffin stamped with a crown and a sceptre. Whatever can it mean?"

"I know," said the great black cat. "Old Peter is dead, and hurrah! I'm now the King of the Cats!"

And the cat rushed up the chimney and never was seen on earth again.

THE WHITE COW

MITCHELL'S FOLD is a circle of enchanted stones standing on a wild moor in West Shropshire. There, in days gone by, lived a white cow, and this white cow was the kindest and most wonderful creature that ever fed on grass.

She allowed anyone who came along to milk her, and, no matter how many persons came, she always had plenty of milk for all, so long as nobody took more than one pailful.

But one winter, when there was a grievous famine in the land, and everybody was living on the milk of the white cow, a spiteful old witch resolved to drive the gentle, fairy creature away, so that no one could get any milk.

Instead of bringing a pail, the old witch brought a sieve, and she milked, and milked, and milked, until she milked the white cow dry. The white cow at once vanished, and was never seen by mortal eye again, although some of the moorland people say that she changed herself into the tallest of the enchanted stones now standing in Mitchell's Fold.

HOW A SULTAN FOUND AN HONEST MAN

A SULTAN wanted to find an honest man to collect the taxes of his realm, but he did not know where to go for such a man, so he consulted a wise counselor, who advized him to publish abroad his need, and then to invite all the applicants to assemble at his palace on a certain night.

"I will show you the honest officer when you ask them to dance," said the wise man.

The applicants arrived in due course at the palace, where they were told by an officer of the Court that they were to advance to the Sultan, one at a time, through a dark and empty corridor. As soon as they were all assembled before the throne, the Sultan said amiably:

"Gentlemen, I should very much like to see you dance. Please dance."

But all the applicants refused, with many blushes, except one man, who danced cheerfully and well.

"That is the honest man," said the sage, pointing to the dancer.

In the dark corridor the wise man had placed sacks of money, and all the dishonest men had filled their pockets as they passed through to the Sultan. If they had danced, their pockets would have sounded like money-boxes being shaken, and so they had refused.

THE KNIGHT AND THE WONDERFUL STONE

A BRAVE English knight in the Holy Land was captured by the Saracens and thrown into a dungeon to die. But a nightingale came and perched on the window of the dungeon, and cheered the knight with her song; and the knight fed her with some of his scanty food, and made a pet of her. He used to talk to her as if she were a human being, and one day he said:

"Ah, sweet bird! If only you could help me to escape!"

The nightingale at once flew away, and as she did not return for three days the knight thought she had been killed by some hawk. But on the night of the third day she flew back to the dark dungeon once again, carrying in her beak a strange stone. The knight took the stone, and, by accident, touched his fetters with it, and to his astonishment and delight they fell off. He then went to the dungeon door, and touched that also with the magic stone, and the door opened.

The knight lost no time in leaving his prison, and he managed to escape to England, to which country the nightingale followed him. There the knight showed his gratitude to his little feathered friend by building her a golden cage, with an open door, in the garden of his castle.

THE KING WHO CAME TO CASHMERE

MANY years ago a Prince and a Princess in India fell in love; but their fathers were at war, and would not let them marry. So the lovers ran away together and hid in a great forest.

But in the evening, when the Prince was looking for food, a robber rode off with the Princess. He put her in a cave, and went to sleep; and the Princess then arose and bound him, and, dressing herself in his clothes, mounted his horse and went in search of the Prince.

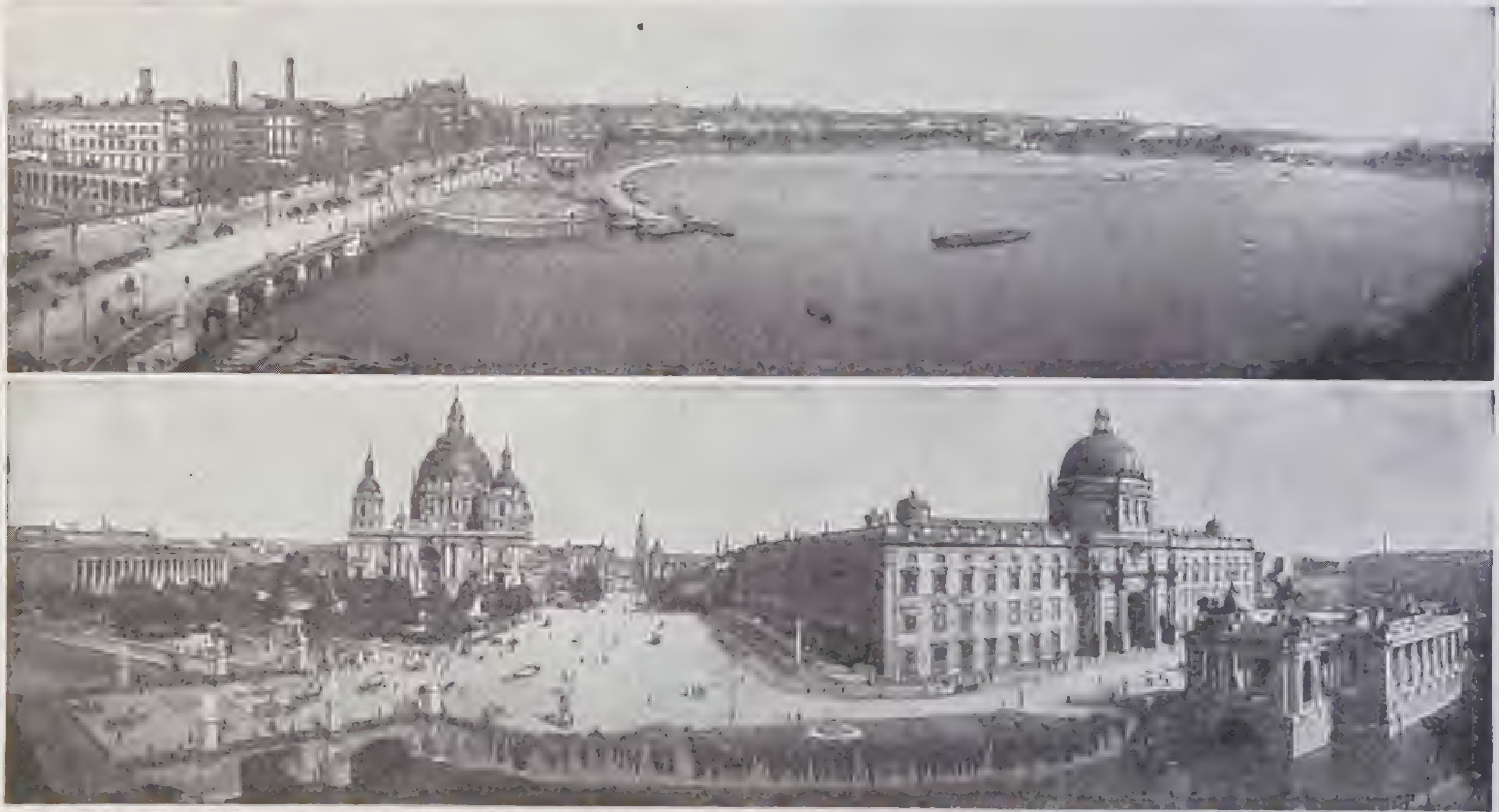
Instead of finding him, she came, in the morning, to the great city of Cashmere. All the streets were crowded with people who were anxiously watching an elephant. The king of the city and all his family were dead, and the people desired to find a new king to reign over them. Now, everybody in India believes that an elephant can tell who is of Royal blood, so the people had let an elephant loose, and they were waiting to see whom it would acknowledge as master.

To their surprize, it ran up to the disguised Princess, and knelt down before her. The people shouted for joy, and carried the Princess to the palace and crowned her king. She dressed up in kingly robes, and no one dreamed that she was not a man.

But when the Prince at last came to the city in search of her, she told the people that she was a Princess, and they made the Prince their king, and she married him and became queen.

THE NEXT STORIES BEGIN ON PAGE 2887

HAMBURG, THE HOME OF GERMAN COMMERCE, AND BERLIN, THE GERMAN CAPITAL



Hamburg, the greatest commercial centre and seaport in Germany, is shown in the upper picture. It is one of the principal commercial cities of the world, and was founded by the Emperor Charlemagne. It is built on the River Elbe, and from its mighty docks great liners go to all parts of the world. The lower picture shows Berlin, the great political centre of Germany and the capital of Prussia and the empire. It is not an ancient city, but is becoming one of the most imposing cities in Europe, with its many fine public buildings and monuments, and its splendid avenues and squares. The domed building on the left is the new cathedral, and the one on the right is the royal palace.

The Unter den Linden, the great triumphal road in Berlin, named after its avenue of lime-trees.

GERMANY AS IT IS TO-DAY

CONTINUED FROM 2600

THE story of England and France all through the centuries is written plainly for those who have eyes to see, in the streets and buildings of their capitals. With Germany it is somewhat different. For the early chapters of its story we must turn, not to Berlin, but to the famous old cities of the various states that now form the German Empire.

Berlin, which lies in the heart of Prussia, is the capital of Prussia and of the empire. Though the history of Berlin dates back to ancient times, it is a modern city, and there is little in it that is more than about 200 years old. This immense and magnificent city, which has grown up in so short a time, filling up the valley of the Spree with palaces and factories, illustrates in a wonderful way the rise of Prussia and the founding of the empire under its leadership.

It was the last elector—Frederick William, known as the Great Elector—who first made elaborate plans for the city, and who planted Unter den Linden, the double avenue of lime-trees which has developed into a triumphal way for his successors. Every ruler of Prussia since his day has beautified the capital by adding fine streets and squares, and bridges, splendid palaces and museums, picture galleries and public buildings of all kinds. Everywhere there are monuments and statues to keep in remembrance the men and the events that have helped to build up Prussia and the empire. In the last hundred years, the population has risen from 200,000 to over 2,000,000, and miles and miles of houses for rich and poor have been built. Berlin is noted for its cleanliness and lack of slum districts, and in the western district, where most of the wealthier people live, there are many handsome houses. Railway lines from all parts of the empire converge upon Berlin, and within the well-kept city itself are railways and conveyances of every kind. Just outside the Brandenburg Gate lies the Tiergarten, a beautiful, lake-dotted park, which stretches along the south bank of the River Spree. Berlin has other parks and many squares and open spaces, and only a few miles away a broad belt of forest land stretches round three sides of the city.

Although Berlin was founded in medieval times, few of its old buildings remain. It is almost as completely a modern city as any city in the New World. Consequently it is a comfortable place to live in; but it is not beautiful. It can boast of none of the

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great architecture of the older cities of Europe, and though there are many statues in its fine, broad streets, and in its parks and gardens, they have little of the living charm of the work of the great sculptors of the Renaissance.

The most striking of the public monuments is the Column of Victory, which was erected to commemorate the victories of the last century which made Prussia the dominant power in Germany. The Column is 200 feet high—nearly as high as the Bunker Hill Monument at Boston, Massachusetts. The finest of the statues is perhaps the equestrian statue of Frederick the Great. The immense bronze statue of the king on horseback, is set on a pedestal, about the base of which are placed statues of his famous generals and groups of soldiers. Another fine statue is the monument to William I, the grandfather of Emperor William II, and the statue of Bismarck, although not so good, is worthy of praise.

From the statue of Frederick the Great, we can look across the Schlossbrücke, or palace bridge, to the imperial palace which is built on an island in the Spree. The palace bridge, which is the handsomest bridge in the city, is ornamented with groups of marble statues, and forms a fine entrance to the palace court.

From the Frederick statue we may walk down the Unter den Linden, one of the finest streets in Europe, to the Brandenburg Gate, the only one of the city gates that was left when the walls were torn down. This great gateway, which was copied from the beautiful gates of ancient Athens, is nearly sixty-five feet high, and is divided by stately rows of pillars into fine carriage roadways. Above it is a group of Victory in a four-horse chariot. This group was taken away, to Paris, by Napoleon I in 1807, but was brought back in 1814 after the War of Liberation.

BERLIN IS NOW THE CENTRE OF THE GERMAN EMPIRE

If you look at the map of Prussia you will see how far-seeing the old margraves were when they made Berlin the capital of Brandenburg. The city, as we know, is built on the Spree, whose waters are carried to the Elbe by the Havel. This, from its first beginning, gave the city water communication with the sea. The Great Elector built a canal to connect the city with the Oder. Since his time other canals have been built, and Berlin now has water communication with almost every part of the empire. It is also the centre of a great railway system. Twelve main railway lines meet at the city.

The city lies in the heart of the Prussian kingdom, and no effort has been spared to make it the centre of the empire, the place to which all Germans might turn as the source of their national life. It is not only the seat of government of the Prussian kingdom, but also of the German Empire, and it is here that the imperial legislature sits. Ambassadors from foreign countries live here, and before the Great War the University had become a Mecca for students from nearly all the other European nations and from America. Berlin is also the headquarters of the postal service, of the imperial army and of the navy. The fact that Berlin has been made the capital of the empire, while at the same time it is the capital of the Prussian kingdom, has added much to the influence of Prussia and increased her power, which was already great.

ALL GERMAN BOYS ARE LIABLE TO SERVE IN THE ARMY

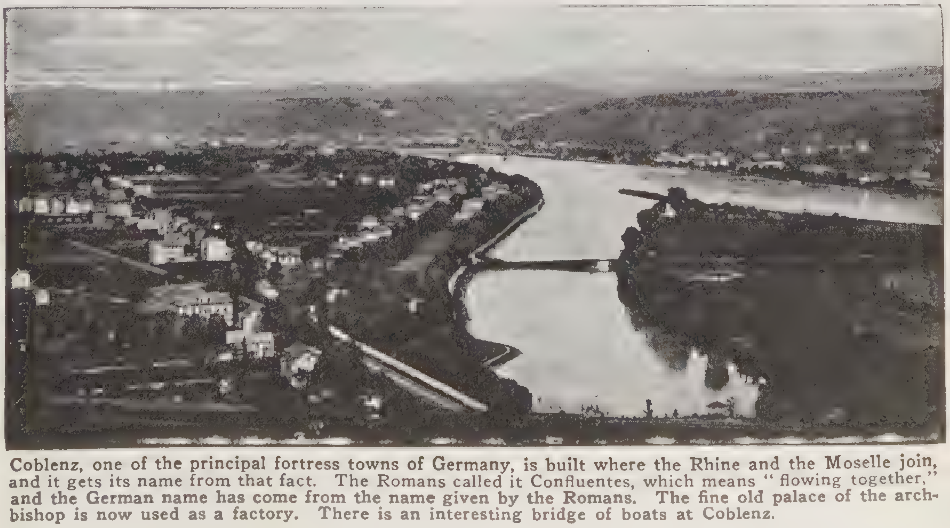
The German army of to-day has been built up on the Prussian army, to which, as we know, the Prussian rulers had devoted time and money without stint. Under the constitution, each state kept the administration of its own army, just as Canada and Australia have the administration of their armies. But, not long after the federation of the empire, the smaller states made treaties with Prussia, as a consequence of which, all the armies, except those of Saxony, Bavaria and Würtemburg, have been made part of the Prussian army, which, as you can easily see, forms much the larger part of the imperial army. The army of Bavaria is under the personal leadership of the Bavarian king.

The greater number of the men of the German nation are soldiers. Every German when he is twenty is liable to be called to the army to serve in the ranks—the infantry for two, and the cavalry for three years—unless some good reason prevents. The strength of the standing army in peace time was fixed in 1914 at a little over 661,000 of what we call enlisted men. This means that as service begins at the age of twenty, tens of thousands of men of that age are put into

FINE OLD CITIES OF NEW GERMANY

Dresden is one of the most beautiful cities of Germany, and has been called "the German Florence." It is a great centre of education and music, and its museum is one of the finest modern buildings in Europe. "Dresden china" was first made, not at Dresden, but at Meissen, a town some distance away.

The ancient city of Cologne dates back to times before the Romans. Its fine cathedral, the towers of which show in the picture, was begun in 1248 and only completed in 1880. Cologne is joined to one of its suburbs across the Rhine by the bridge shown here, which was opened in 1916 and took the place of the famous Bridge of Boats, which had provided a means of crossing the river for many years.



Coblenz, one of the principal fortress towns of Germany, is built where the Rhine and the Moselle join, and it gets its name from that fact. The Romans called it Confluentes, which means "flowing together," and the German name has come from the name given by the Romans. The fine old palace of the archbishop is now used as a factory. There is an interesting bridge of boats at Coblenz.

training for active service every year, and you can imagine what an enormous army of trained men this provides at the end of seven years, when the young men leave the active reserve and fall back into the landwehr. In war time, all youths of seventeen are liable to be trained for active service. Each of the twenty-six states sends a stated proportion of its young men to join the army every year.

The German navy, of which the Prussian navy was the foundation, ranks second in size among the great navies of the world. As in the army, compulsory service is maintained. The young men of the coastal region are excused from service in the army, but in its stead are compelled to give their service to the navy.

The emperor is commander-in-chief of the army and navy and William II has given a great deal of his time to both. No detail is too small for his notice. From the planning of a great battleship, or the placing of a battery of huge guns, and the high explosives for their use, down to the bicycles that the men ride, the boots that they wear, and the cloth of which their uniforms are made, everything is brought to his personal attention.

The navy has always been his special care. The dearest wish of his heart has been that Germany should have command of the seas, and since his reign began, battleship after battleship has been built, and sailors have been trained to man them.

THE HARBORS WHERE THE GERMAN SHIPS ARE BUILT

At the same time a great merchant navy was built up. Great ship-building yards were constructed along the sandy shores of the Baltic and North Seas, at the mouths of the rivers where the water is deepest, at Stettin on the Oder, at Danzig on the Vistula, at Hamburg on the Elbe, at Bremen on the Weser. Monster battleships, liners among the fastest in the world, and submarines strong enough and large enough to cross the ocean have come from these great yards.

The headquarters of the navy are at Kiel, at the Baltic end of the canal which cuts across the province of Schleswig, to join the North Sea to the Baltic. Wilhelmshaven is also a large naval port, and so are Cuxhaven and Danzig. The North Sea entrance to the canal, Wilhelmshaven, Cuxhaven, and the Elbe are all protected by the great fortifications on the island of Heligoland. When this little island was ceded by the British to the Germans in 1884, it seemed to be fated to be devoured, bit by bit, by the sea, but since that time it has been built up into one of the strongest fortresses in the world.

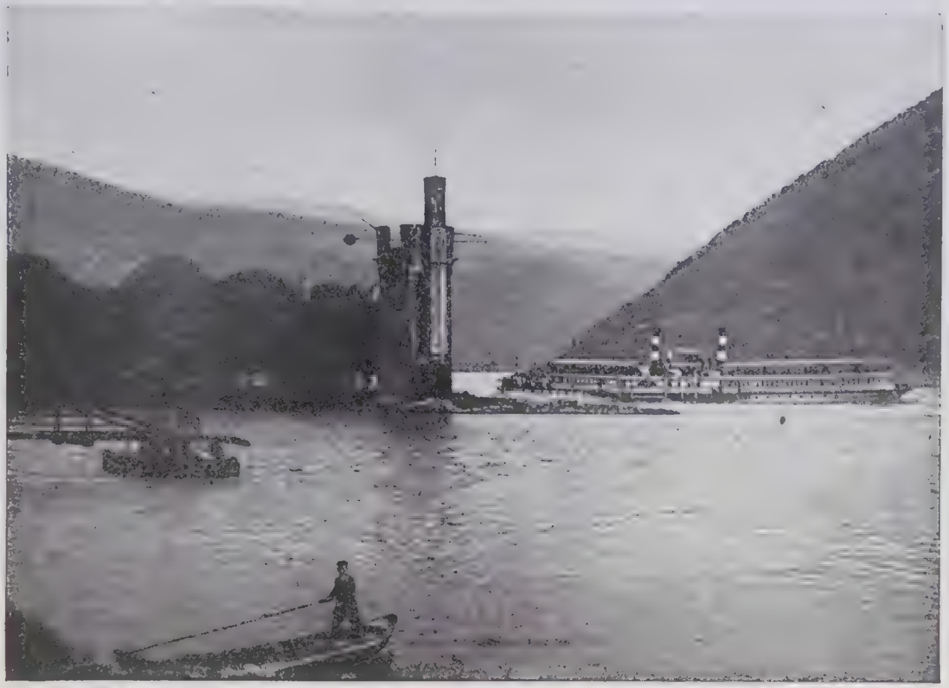
The two ports of Hamburg and Bremen both belonged to the old Hanseatic League and both have a republican form of government within the empire. They are the headquarters of the great ship companies, which have had so much to do with the extension of German commerce.

Hamburg is built on the Elbe and a steamer trip on the river will best reveal to us the wonders of the port, which is connected by railways with every part of Europe and is one of the most important places for trade in the world. We marvel at its great basins and acres of docks until we remember that they have been built to hold a large number of the ships required to carry into the country a great proportion of all that Germany needs, and take away much of what she has to sell.

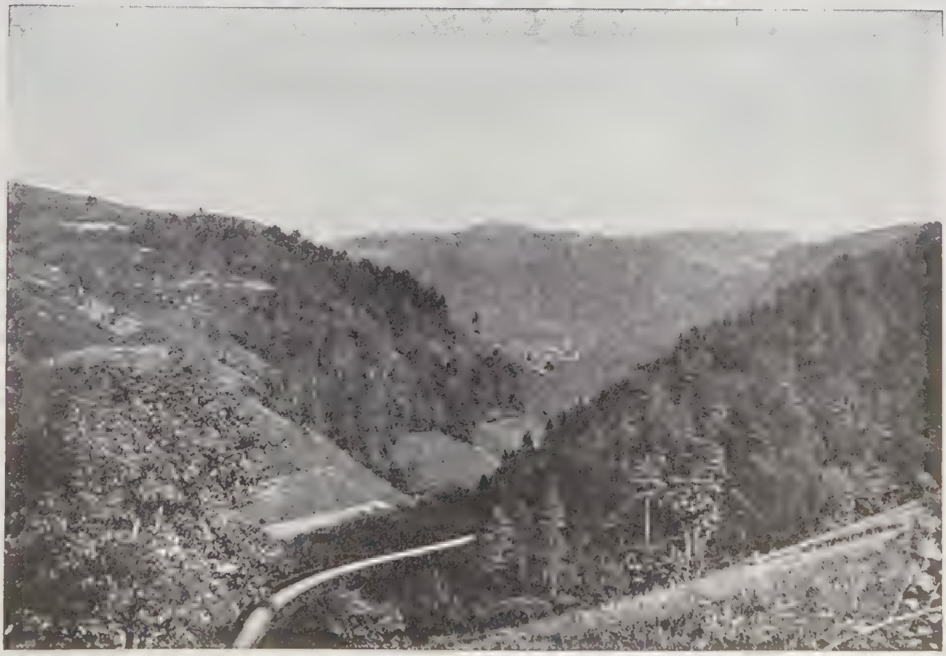
THE TOWNS AND CITIES ON GERMANY'S GREAT RIVERS

We know what she needs to some extent, from our own imports—tea, coffee, spices, and other things grown in hot climates—while in addition it is necessary that she should import quantities of raw material for manufactures. To find out what she has to sell and what she manufactures, let us now travel up the rivers and on the lines of railways that run in their valleys and connect all the important centres. The Elbe, with its long, navigable course—right into Bohemia—and its many tributaries, and its system of canals, plays an important part in the trade of the empire. The Spree, on which Berlin stands, reaches it through the Havel. On the banks of the Elbe are Dresden and Magdeburg. Dresden, the capital of the Saxon kingdom, has one of the greatest picture galleries in the world, and other great collections of art besides. But if we want to see the making of the famous Dresden porcelain, we must go to the ancient town of Meissen, a few miles down along the Elbe. Magdeburg is in the midst of great fields of beetroot,

A FAMOUS RIVER AND A FAMOUS FOREST



The "lordly, lovely Rhine," about which so many poets have sung so often, is one of the playgrounds of Europe. A favorite spot is Bingen, "fair Bingen on the Rhine," with its mouse tower, shown here. It is here that the wicked Bishop Hatto is said to have met his fate, as told in the poem by Robert Southey.



The Black Forest, which stretches for about a hundred miles along the Rhine, is full of lovely valleys and wooded heights. The forest has many busy mining centres, and, with its network of narrow valleys and its countless trees forming a barrier to the passage of an army, it is part of the great scheme of defence of the German Empire. This picture shows the lovely village of Nussbach nestling among the trees.

The photographs on these pages are by the Photochrome Co., Voigt, Frith, Beckett, E. N. A., and others.

from which enormous quantities of sugar are made. Magdeburg has also huge iron foundries and many other factories, and is a great centre of trade. The tomb of Otto the Great is in the ancient cathedral.

The River Oder runs a similar course to the Elbe, through fields of beet and potatoes or flax, and grain of different kinds. It also connects with Berlin by canal, so that the capital may be said to have two ports—Stettin, on the Oder, and Hamburg, on the Elbe. We have already seen how wonderfully Berlin has grown in its handsome west-end quarters. Its development in the matter of trade and factories is no less surprising. Thousands of workmen make in it machinery and locomotives, arms, chemicals, all sorts of woven goods, and every possible thing needed in furnishing a house.

Breslau, on the Oder, the second city in Prussia, is the capital of Silesia, which was taken by Frederick the Great from Maria Theresa. Like Berlin, it manufactures steam-engines and railway carriages, and linen and cotton goods.

These two great northern rivers come from the ring of mountains that have kept Bohemia so shut off through the centuries — the Giant Mountains and the Ore Mountains. Round about the lowest slopes of these mountains lie many coalfields, and mines of iron and zinc, and many other precious and useful metals. Hence the railway lines are thick here, as they are in our busy industrial districts at home.

THE MANUFACTURES THAT HAVE HELPED TO MAKE GERMANY PROSPEROUS

The wool of the sheep of Saxony and Silesia is used in the making of the famous flannels and warm materials now prized all over the world. Formerly Germany was an agricultural country. It grew enough grain and roots to feed its people, and raised great numbers of sheep, cattle, and horses. Now its chief wealth lies in its great manufacturing powers; and its energy and ability in this direction are the wonder of the world. We have just glanced at some of the industries in the valleys of the northern rivers. Leipzig, where the Supreme Court of the empire sits, is known to Americans for its great Conservatory of music. It is the great seat of the German book trade, and at Jena are made lenses, for microscopes and telescopes, which are famous all the world over. We shall find cotton and silk factories in the north-west of the country, where it is easy to obtain the raw material from abroad, and coal from the neighboring coal-fields. One of the largest of these is in the Ruhr Valley, near the Rhine, and upon it depend the enormous iron and steel works which supply most of the plates of iron and steel, the boilers and engines, and thousands of things needed to build up a great liner or warship, as well as cannon and arms of all kinds needed by the Army and Navy.

THE CATHEDRALS AND FACTORIES ON THE BANKS OF THE RHINE

In Krupp's great factory at Essen alone there are many thousands of people at work, and for miles round are growing towns, with tall, smoking chimneys, and the roaring blast furnaces and deafening clang of metal-working, reminding us of the Pittsburg region at home. Rohrort, the largest inland port in Europe is formed of three towns at the point where the Ruhr joins the Rhine, and here are docks and shipbuilding yards, besides business centres for grain and timber. Everywhere, too, in this district are factories in which furniture of every kind is made.

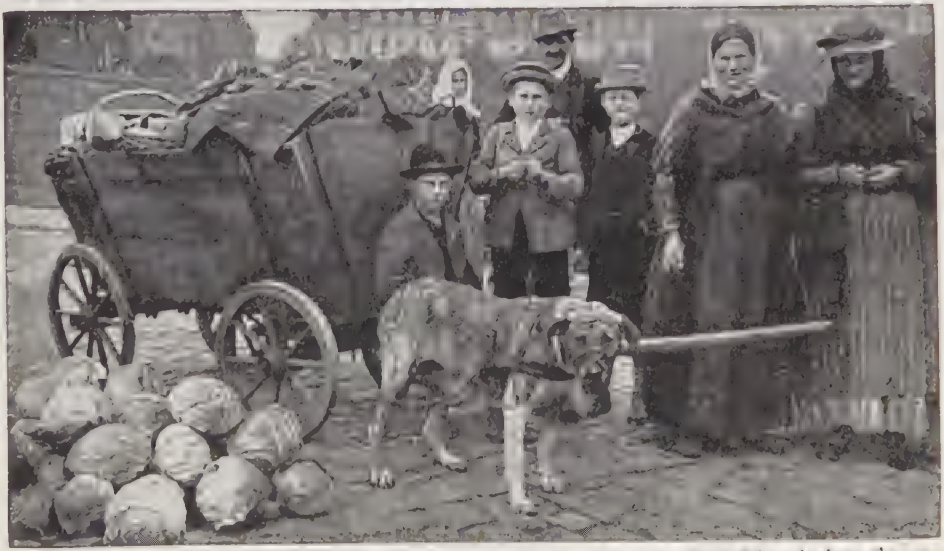
There are many passenger steamers on the Rhine; one runs from the mouth, in Holland, as far as Mainz, and provides an easy and pleasant way to see this wonderful part of Germany. After passing the flat part of the course, where the interest of the busy work going on makes up for the dulness of the scenery, we reach Köln—better known to us by its French name of Cologne—famed for its cathedral, one of the most magnificent Gothic buildings in the world. It was over six hundred years in building, and, when finished at last on the old plans, was opened in the presence of the Emperor William I. and the sovereigns of Germany.

Not far from Köln is Aachen, called by the French Aix-la-Chapelle, the home of Charlemagne, and now an important manufacturing centre. The famous cathedral, which was founded by Charlemagne, was for centuries the coronation place of the old German kings, and it was on a chair taken from his tomb that many of the kings were crowned. A bronze chandelier, given to the cathedral by Frederick Barbarossa, still hangs over

THE OPEN-AIR LIFE OF GERMAN CHILDREN

The Germans pay much attention to the health and education of children, and they are always thinking out new ideas for schools. Open-air classes like this one studying botany were first started by them.

All German children are taught that it is important to live as much as possible in the open air, and here we see a German mother with her children and their nurse taking their midday meal in the garden.



This is a familiar street scene in many German towns, and we can see how the children look as they go to, or come from, their schools. The tradesmen's carts are drawn about many of the cities by big dogs.

the place where the body of Charlemagne was laid.

THE TOWNS OF THE RHINE AND THE MOUNTAINS OF THE FAIRIES

The hills begin to rise each side of the broad river after leaving Cologne, and we pass numbers of towns and villages with promenades close to the river shaded by stumpy trees. The most important towns are Bonn, with its fine university and the romantic seven mountains close by, so full of legends and fairy stories; and Coblenz, beautifully situated where the Moselle joins the Rhine. On the terraced slopes of both rivers grow the vines from which much famous wine is made, and this trade makes Coblenz and other towns very busy.

On the Moselle is the oldest town in Germany, Trier, which the French call Trèves, with its beautiful Roman bridge and gate, and fine remains of theatre, baths, and temple. Here, too, is a most interesting brick building, called the Basilica, which was built perhaps in the Emperor Constantine's time, and was used for the administration of justice. It is now used as a Protestant church.

THE FIGURE OF GERMANIA KEEPING WATCH ON THE RHINE

From Coblenz to Mainz the scenery is very beautiful, with hills rising steeply from each side, many of them crowned with castles famous in the country's story in the Middle Ages; and everywhere grows the vine, and everywhere, too, are traces of the Romans and the French, who both occupied it in the past.

A few years after the Franco-German War, which gave Alsace-Lorraine to Germany as an Imperial territory, an immense national monument was set up on the hills opposite Bingen. It is the figure of Germania keeping watch on the Rhine. It is thirty-four feet high, and bears aloft the Imperial crown and the laurel-wreathed sword. On the huge base are portraits of the Emperor William I. and other German princes and generals, also representations of the troops from different states of the empire, together with the words of the famous national song, "Die Wacht am Rhein"—"The Watch on the Rhine."

SOME FAMOUS TOWNS, A FAMOUS SHOEMAKER'S SHOP, AND A FAMOUS FOREST

Mainz—in French, Mayence—the home of Gutenberg, has a fine position at the meeting of two rivers. It was founded by the Romans, and has a long and interesting history. It has a very famous cathedral, and its museum is also famed for its rich collection of Roman remains. Among other treasures is a Roman shoemaker's workshop, all complete with tools, leather and sandals. Shoes are still made at Mainz, and, like Coblenz, it is a great centre for the wine trade.

Frankfort-on-the-Main, one of the old free cities, and the place where for centuries the emperors were elected, is the centre of the great dye industry. As we have already learned, the most beautiful dyes, and many chemicals of great value in the arts and sciences, are made from coal-tar, which formerly was largely allowed to go to waste. In this work, Germany has long been the leader, her inventions have set the world an example in saving and making into a source of national wealth what was formerly looked upon as of no value.

Strassburg, the capital of Alsace-Lorraine, is two miles from the Rhine, but connected with it by canals and the River Ill. It is a sort of junction between Germany and the trading and manufacturing places just over the borders in France and Switzerland, and has always been a busy and important place. Its history has been an eventful one, which has left many traces in its fine cathedral and public and private buildings. The Vosges Mountains are the western boundary of this upper part of the Rhine, and in its valleys are many ironworks, and weaving and other industries. Mülhausen is the most important manufacturing town in the province, with its iron foundries and engineering works. It also employs many people making cotton goods, chemicals, and paper. It is on the canal joining the Rhine and the Rhône basins.

East of the Rhine, in Baden, lies the beautiful Black Forest. Here the peasants in their quaint little houses carve wood figures very cleverly, and also great numbers of cuckoo clocks. There are also many mines in the mountains, and industries of various kinds. Many visitors go to Baden to drink the mineral waters. The plain of Baden is very fertile.

In the early days, a large part of Germany was covered by forests, and many of the great legends of the people still hang round them. Though, of course, a great part of these forests has disappeared, the country, especially in the mountain regions, is still well wooded. The governments of the various kingdoms that constitute the empire long ago recognized the value of the woods, and they are looked after and cultivated as carefully almost as garden lands. There are special schools of forestry, where the young foresters study trees scientifically, and as a consequence, the woods and forests are a steady source of income to the country. In the wooded sections, wherever a tree is cut down, a young tree is planted to take its place. Every part of the tree that is cut is used for lumber, or fuel, or pulpwood, or other useful purpose, and there is none of the waste that goes on in our forests and of which thinking people are ashamed. The forest regions comprize altogether about a fourth of the total area of the empire. Included in them there are several large forests, and of these of course the most famous is the Black Forest.

THE MIGHTY RIVER IN THE BLACK FOREST, AND THE TOWNS ON ITS BANKS

From the Black Forest rises the mighty Danube; the upper part of its course lies in Würtemberg, a hilly agricultural country about the same size as New Jersey. At Ulm the Danube passes into the large kingdom of Bavaria, and upon it, or its tributaries, are many great cities.

There is Munich, the capital of Bavaria, on the Isar, the third largest city in the empire, which attracts the art-loving world to see its treasures of pictures and its museum collections, and also to hear the concerts for which it is famous, or to attend its great university.

Augsburg possesses abundant water power, obtained from canals which cross the town. This has given rise to industries such as weaving and cotton-spinning, and making machinery and paper. In the past it was a centre of traffic from the north of Europe to Italy and the eastern part of the Mediterranean; and its buildings remind us of the rich citizens of the Middle Ages, and the money-lenders who helped such great sovereigns as Maximilian I. and Charles V. Augsburg was a free city from the thirteenth century until the time of Napoleon, when it was added to Bavaria.

There is much that is interesting to be seen at Regensburg or Ratisbon, often called the key of the Danube, from its position; and fighting has often raged round it, from the times of the Romans right down to those of Napoleon Bonaparte. The diet of the Holy Roman Empire met in Regensburg for nearly one hundred and fifty years.

Ludwig I., King of Bavaria, built, in the last century, a German temple of fame a few miles out of Ratisbon. It is a copy, in grey marble, of the most beautiful of the Greek temples, the Parthenon at Athens. Over the north entrance is sculptured a representation of the battle won by Hermann over the Romans; on the south side, facing the Danube, is shown Germany regaining her liberty after the battle of Leipzig. Inside, running round the entire hall, is a frieze showing the history and life of the Germanic people before they became Christians. Over a hundred busts represent famous Germans who helped to make history. William I., the Victorious, was added in 1898. There are also tablets bearing the names of great men of whom no portrait exists, and some commemorate the work of those whose names, even, are unknown, such as the writer of the greatest early German poem and the architect of Cologne Cathedral.

THE TOWN THAT SENDS CHILDREN'S TOYS ALL OVER THE WORLD

Not far from Regensburg is Nüremberg, a free city of the empire till 1806, since when it has belonged to Bavaria. Long ago it was a centre of trade between Germany, Venice, and the East, and then the discovery of the sea route to India, round the Cape, took away much of its commerce and prosperity. It has very interesting old houses, like so many of these South German towns, and is full of reminders of the long wars, as well as of the wealth, importance and taste of a "City of the Empire." It is famous now for the great numbers of toys that pass from its workshops to delight children everywhere; also it makes machinery and metal wares, and lead pencils. We are now nearing again the Ore Mountains, whence we set out on our tour to the various large cities of Germany. In nearly all of these cities are to be seen fine old cathedrals, picturesque market-places and town halls, also universities, often dating back to the far past. And everywhere there are statues and war memorials, as in Berlin, linking the past with the present.

What numbers of different sorts of people we have passed on our road! Peasants in different states wear different costumes; and manners and customs and speech vary as much as they do in different parts of England and Scotland. Germany is only four and a half times the size of New York State, but there are now perhaps eighty millions of people living in it.

THE PEOPLE OF GERMANY AND THEIR RELIGION

More than half that number of people live in Prussia. Many work in the fields and vineyards and beautifully-kept forests, which cover a quarter of the country, in rain and shine. Others are to be found in the mines and factories, yards and shops, in the ports and ships, in the army, in the schools and universities.

We have heard the gay Rhinelanders singing the glories of the Fatherland and the beauties of the country, as the soldiers marched, as the schoolgirls played in the woods, as the students tramped up and down the hills. In other parts of the country the people are graver and slower, according to the branch of the German family to which they belong. Some of the differences that have arisen in the past have been on account of religion. North Germany is chiefly Protestant. South Germany is mainly Roman Catholic, and in the Rhineland are numbers professing both faiths. Slowly jealousies and dislikes are passing away under the influence of common aims and interests, and increased facilities for traveling about and mixing with one another, and for better education.

THE SPLENDID SCHOOLS TO WHICH THE GERMAN CHILDREN GO

Germany has always been in the forefront in matters of education, and to-day —except in the districts where so many poor Polish Jews live, on the borders of Russia—there are very few people unable to read and write. It was from Germany we learned how to make first lessons interesting to little children in kindergartens, and great pains are taken not only in elementary schools, but in higher grades, to make learning useful and attractive. The fees in the higher schools are so low that even poor people can send their children, and as there are many universities, and the expenses of living at them are small, almost any student can take advantage of the highest education to be had. Then great attention is paid to teaching the various trades under the best possible conditions, so that workers get a thorough training to fit them to earn their living. The Government has done its best to have the most useful subjects taught in schools, so that time should not be wasted, and to spread the knowledge of trades and industries, so as to encourage skilled workmen all over the empire.

The Germans were the first nation to pass a law to provide small pensions for old people who are no longer able to work, and who have not been able to save enough to live upon. The money for these pensions comes from an insurance fund. Premiums are paid just as in any other form of insurance. The worker has to pay half the small premium required, the employer has to pay half, and the state adds a certain yearly sum to every pension. No one who earns over $500 a year, however, is entitled to an old-age pension. There is also a law to provide funds for the care of workers in time of sickness. For sickness insurance the worker has to pay two-thirds of the premium and the employer one-third. The premiums for both the old age pension and sickness insurance are deducted from the amount due to a worker before he is paid. But the sums are small, and if a worker falls ill, his doctor's fees and hospital bills are paid. If his illness is serious, he may receive sick pay for about six months. In addition, employers are obliged to pay accident insurance for all their employees, and if a worker is injured in any way while he is at his work, the law decides the amount that he is to receive, so that his family shall not suffer while he is unable to work. If he dies, his wife receives a pension, and an allowance is made for each of his children, until the boy or girl has reached the age of fifteen.

Before the Kaiser came to the throne, Germany had been very slow in extending her borders beyond the seas and finding new markets for the goods she manufactured. At first travelers visited foreign parts, and traders from the old free cities followed them, setting up factories on the west and east coasts of Africa in places yet empty and un-governed by the European nations who possessed other parts of the continent.

THE BEGINNING OF THE GERMAN COLONIES

At first, Prince Bismarck, who thought the German people had no genius for building colonies, opposed any attempt at securing foreign territory. He was won over, however, and in 1884 he directed that the German flag should be hoisted on the western coast of Africa, over settlements made there by a merchant of Bremen. This was the beginning of the German colonies; which, before twenty-five years had passed, included large sections of West and East Africa and of Togo and Kamerun in Western Africa. After the Philippine Islands and Guam, one of the Ladrone or Marianna Islands, had been ceded to the United States by Spain, Spain also sold the Caroline Islands and the rest of the Marianna Islands to the German Empire. About the same time, the beautiful Samoan Islands were divided between the United States and Germany. The empire also gained possession of the northern part of New Guinea, and later on, of two settlements on the Chinese coast.

Every means was taken to teach the German people about these distant places. Colonial exhibitions were held, where maps and photographs and samples were shown and information was given, in the hope that colonists would be encouraged to go out and settle. Bismarck was right, however. The Germans are a commercial rather than an adventurous people. In spite of the fact that the government built railways through its African territory, few Germans except the soldiers and officials went there to live. The people preferred to go to civilized countries, and large numbers came over to North and South America. They have formed large German-speaking settlements in Brazil, Argentine and Chili, where they have their own schools, and live very much in the same way that they did in their home country.

DROPPING THE PILOT

This, the most famous of all Tenniel's "Punch" cartoons, shows Bismarck, the old pilot who had guided the German ship of state into the harbor of prosperity, passing from the direction of affairs, while the new captain, young Emperor William, who dismissed him, looks down from the deck.

A few years after the consolidation of the German Empire Prince Bismarck brought about a great change in the life of the nation by introducing a high tariff on imported goods. Up to this time, the Germans had been largely agricultural people, but they now became a manufacturing people. Great factories were built, and the old cities began to teem with life. Within a short time immense quantities of manufactured goods were produced, and not only was the home market supplied but the manufacturers began to send their wares to other countries. As the wages paid to the workers have always been small, the manufacturers were able to make their goods at a smaller cost and sell them at a lower price than the merchants of other nations. As a consequence, the commerce of Germany grew by leaps and bounds. A magnificent merchant navy was built up, ships sailed from the northern ports, of which we have read, with their holds crammed with goods, for sale in every corner of the world, and wealth flowed into the country.

HOW THE YOUNG RULER DROPPED THE OLD PILOT

Prince Bismarck continued in office as chancellor throughout the reign of the Emperor William I, and the short reign of his son and successor, Frederick. But when William II ascended the throne it soon became evident that the old statesman's days in office were numbered. The new emperor, a strong-willed young man of active mind, wished to be ruler in truth as well as in name, and before two years had passed, he dropped the old pilot whose guiding hand had steered the ship of state during the difficult years after federation. Since Prince Bismarck's resignation, the emperor has been able to find chancellors, who have been obedient to his will and ready to carry out his instructions; but he has guided the state by the rules laid down by the master mind of Bismarck, the real founder of the empire.

The emperor's restless, energetic nature has led him to make full use of the power given to him, and he has taken almost as active a share in every branch of imperial affairs as he has in the army and navy. On the whole, this has helped to strengthen national feeling. The emperor's name has been constantly on the lips of the people, his doings have been constantly in the public eye, and gradually the mass of the people have learned to give him the greater part of the personal loyalty which had before been divided among the princes of the lesser states.

In 1914 the Great War began, and put an end to the prosperous life of the nation. The great merchant navy was scattered. The armies and navies of the allies took possession of the colonial territories of the empire, and no one can yet say what the ultimate fate of these islands and great tracts of forest and mountain land will be.

These German colonies included more than a million square miles, with a native population of more than 12,000,000. Though only a few white people lived in them, and the expenses were greater than the revenue, the German government had great hopes of future growth and development. When the war comes to an end the Germans will no doubt try to get their colonies back, but the people of South Africa, who have had so much to do with conquering them, will probably object very strongly.

The city of Bremen was founded in the eighth century, by one of Charlemagne's missionaries to the heathen Saxons. It became the centre of a diocese, which was afterward one of the numerous church states of the empire. The town belonged at times to the Hanseatic League, and after the Thirty Years War it was made a Free City. The ancient diocese now shows the curious picture of a republic within an empire. Bremen, with its port of Bremerhaven, has a large import trade and is the centre of one of the great shipbuilding industries of the world. This picture shows the older portion of the city, in which the ancient cathedral stands.

THE NEXT STORY OF COUNTRIES IS ON PAGE 2895.

THE STORIES OF CHARLES DICKENS

TWO more of the famous Dickens novels are told here in the form of short stories. "The Old Curiosity Shop" has not so strong a "story" interest as "Barnaby Rudge." In the first named we are deeply interested in the many strange characters to whom the author introduces us, but in "Barnaby Rudge," while the characters also interest us greatly, the story itself is one that can "hold children from play and old men from the chimney corner," so strong a grip does it take upon our mind. Of course, it is impossible in our limited space to bring in all the characters that figure in the original novels; but all who play a part in the story, that could not be left out, will be found in the following pages.

THE OLD CURIOSITY SHOP

CONTINUED FROM 2675

THE curiosity shop contained many quaint old things—rusty weapons, suits of mail, figures in china, tapestry, and pictures, but nothing in it looked older or more worn than its proprietor. He was a little old man, with long grey hair and bright blue eyes, and he lived here with only his granddaughter Nell Trent, a fair-haired, blue-eyed, sweet-tempered child. But though their years were so far apart, they loved one another dearly, being constant companions, and the old man's one desire was to build up a fortune for the child, that she might some day become a "fine lady." They had an errand boy, awkward and shock-headed, whose name was shortened by everyone from Christopher Nubbles to "Kit." And every night, when the old man used to go out on some mysterious errand, coming back in the early morning, he did not know that the faithful Kit had been watching over the house in which slept the lonely child, so that no harm should come to her.

Now, although Nell and her grandfather seemed to be all alone in the world, they had one relation, and that a very near one, no more distant, in fact, than Nell's brother Frederick. He was a selfish, spendthrift young man, always anxious to obtain money from the grandfather, and often reproaching him as a miser. If he had only known the cause of the old man's poverty! The secret of the nightly journeys was simply this: the old man tottered out to gamble with every penny he could get, in order to win more money for little Nell. Alas, to do this he had been obliged to borrow from Mr. Quilp, a misshapen dwarf, whose delight in life it was to make other people miserable.

When Quilp guessed how the old man spent his nights he boldly questioned him about the matter, and, instead of lending him the money for which he was asked, he had the goods in the shop sold off to redeem the debt already owing. Quilp falsely told him that Kit had been his informant, and thus the old man grew very angry with the clumsy boy, and spoke of him so harshly that Nell had to forbid Kit the house. Even when Kit asked her to make her home with his hard-working widowed mother, now that she and her grandfather had no money, the child dared not do so. Quilp's anger had been roused against Kit when the boy had said that he was "an uglier dwarf than could be seen anywhere for a penny," which, by the way, was undeniably true, but none the pleasanter for that.

There was nothing now for the grandfather and Nell to do but to leave the Old Curiosity Shop, and so they fled one night, wandering until they came into the country. Kit took home with him Nell's little caged linnet, and he soon obtained a good post as groom to a kind, rosy-cheeked, chubby old man named Garland. As the wanderers rested in a country churchyard they heard the sound of voices near at hand, and when they went down a path they saw two men repairing a Punch and Judy show. They made friends with the men, stayed at the same inn overnight, and traveled with them the next day. But it was not long before Nell began to grow afraid of these men, who had got it into their heads that the old man and his granddaughter had run away from well-to-do friends, and that they were certain to gain a reward if they could restore them. So the child, who had now the cares of a grown woman on her shoulders, and the arranging of all the plans for the future for her aged companion as well as for herself, again planned their escape, this time while the men were exhibiting their show at a fair.

Nell encouraging the old man, they continued their wanderings. When quite exhausted they obtained shelter from a lonely schoolmaster, and, after leaving him, from a Mrs. Jarley, who traveled in a caravan with her waxwork show. Mrs. Jarley took a great fancy to the tender-hearted child, and employed her to show the wax figures to the country folk, while she also cared for the grandfather.

But the old man, who was no longer sane in his overmastering desire to win money to make Nell a "fine lady," took every penny he could from the poor child so that he might gamble with it; and at length Nell found that he was actually intending to steal money from Mrs. Jarley, with which to try his fortune again. The loving heart of his granddaughter could not endure the thought that he should stoop to dishonor, and she persuaded him to leave the hospitable Mrs. Jarley before he was guilty of robbing her.

Now, Quilp had a friend, just such a friend as one might expect the wicked dwarf to have—an attorney named Sampson Brass. Between the two, many people had come to grief, and many wrongs had been done to innocent persons. For reasons of his own, Quilp had obtained the post of clerk in Sampson Brass's office for Richard Swiveller, better known as "Dick," who was a friend of Frederick Trent. Dick was a warm-hearted, careless youth, always in debt, and when not quite sober he was apt to let out secrets. That he had a great many debts we may know from the fact that there were certain streets in

LITTLE NELL AND HER GRANDFATHER IN THE OLD CURIOSITY SHOP

LITTLE NELL COMFORTS HER GRANDFATHER

London down which he dared not walk for fear of his creditors, and he was afraid that he would soon be obliged to seek his fortunes elsewhere, as he made street after street a closed thoroughfare.

Mr. Brass had a lodger, a single gentleman of eccentric habits, who seemed to do little else than sleep both night and day, unless a Punch and Judy show came near. Then, indeed, he wakened up, made the showmen come to his room, talked earnestly with them, gave them something to drink, and sent them away again. The little maid-of-all-work was an ignorant, shy, nameless creature whom Miss Sally Brass ill-used and half starved. Dick, however, made friends with her, being sorry for her loneliness and being lonely himself. He taught her to play cribbage, bought—or, rather, incurred the debt of—food for her, and dubbed her "the Marchioness."

It often happens that those who are the poorest are most willing to share the little they have. Nell found it so now, for she received many kindnesses from the humble folk who took pity on her. Footsore and weary, she and her grandfather lay down to sleep near a river. They were roused by two men who were drawn in their boat by a horse, and were helped by them upon their journey. Tired and cold, an uncouth man led them to his furnace fires and made them rest there overnight. But once more someone was to be of use to them; this time their kindly old friend, the schoolmaster. He had received a better appointment in a distant town, and his surprize and joy were great when he met his two travelers on the way. Together they walked and talked until they reached his new home, and there he found for Nell the rest she so sorely needed. It happened that the old woman who formerly had the care of the church, opening and closing it at service times, and the showing of it to visitors, had recently died; the work was light, and suited for the delicate child. The schoolmaster obtained it for her, and she and her grandfather settled down in the place. Thus at last they found peace and contentment, beloved by all, and happy in their mutual love. They were to spend many peaceful days in the beautiful, smiling country.

MRS. JARLEY AND NELL IN THE WAXWORK SHOW

Meanwhile, Quilp decided to ruin Kit altogether, and he concocted a plan with his friend Sampson Brass. Both Sally Brass and her brother declared to Dick that of late they had missed several half-crowns and a silver pencil, but they knew of nobody who could have taken them. One day Kit came to the office, and a five-pound note had been laid down carelessly as a trap for him. He had gone but a little way, on leaving the office, when he was ordered to come back, and, being certain of his innocence, the boy consented willingly to having his pockets searched. He became quite relieved when there was discovered in them nothing of any importance, but he was much amazed when the five-pound note was found in the lining of his hat. Of course, he was tried and sent to prison. Who could believe, after such evidence against him, that he was not guilty? Shortly after this Brass paid Dick his salary and dismissed him.

HOW "THE MARCHIONESS" REPAID DICK SWIVELLER'S KINDNESS

Dick Swiveller had a bedroom in a house close by Sampson Brass's office, and there, within twenty-four hours of his dismissal, this foolish young man was paying the penalty of his drinking habits, for he lay on his bed stricken with a raging fever.

In about three weeks' time he recovered consciousness, but he imagined himself still to be dreaming when he saw, close by, "the Marchioness" playing cribbage by herself. She explained to him that she had run away from Sally Brass, and had nursed him through his illness. Dick asked what had happened to Kit, and the small servant told him that also; but she knew more about it than most people, for she had listened at the keyhole of the office door, and had overheard a conversation between Sally and Sampson Brass, from which she gathered that Brass was to put the five-pound note in Kit's hat, have him sent to prison, and he would thus pay Quilp's grudge against the boy. Dick was, of course, too weak to rise from bed, but he wished to do so at once that he might proclaim abroad Kit's innocence.

KIT IS RELEASED AND SAMPSON BRASS IS PUT IN PRISON

Luckily, however, in one way, "the Marchioness" had been obliged to sell his clothes to get some money for him when he was ill. This did not prevent Dick from sending her at once for Mr. Garland. Kit's employer came in great haste, and showed much kindness to the invalid, and of course Kit was soon released; but though Sampson Brass was imprisoned, his sister managed to escape. It so happened that the lawyer who had aided Mr. Garland in the punishment of Sampson made inquiries about Dick, and found out that an aunt of his had died, leaving him with an income of $750 a year. In his gratitude towards her, Dick sent "the Marchioness" to school now that he had some means of his own; and when she left, now grown into a bright, clever young woman, she married the man whom she had nursed so tenderly.

Quilp was warned by Sally Brass that he would be arrested if he did not escape quickly. On a dark, murky night he tried to make his way along the wharf as the officers came to arrest him, but he staggered and fell, and next moment was fighting with the cold, dark water. His body was found some days later, and it was buried with a stake through the heart at a lonely cross-roads, that being the old way of burying people who had committed suicide, though Quilp's death was an accident.

WHO THE MYSTERIOUS "SINGLE GENTLEMAN" WAS, AND WHAT HE DID

The lodger at Sampson Brass's had now gained a clue to a certain mystery, thanks to his inquiries of the Punch and Judy men, and he at once went forth on a search for Nell and her grandfather. He told Mr. Garland that he and the grandfather were brothers. When they were both young he was very delicate, the grandfather being the elder and stronger of the two. Both fell in love with the same beautiful girl, but the younger one remembered how kind his brother had always been to him, and he left his home to travel abroad, so that he should not stand in his brother's way. The two young people had married, and one daughter was born to them before the mother died. This child, when grown up, had married a handsome young man, who had treated her badly. Both she and her husband died young, and left the old man with two grandchildren to look after—Nell and Frederick Trent. The girl had become sweet and beautiful like the mother, the boy a worthless fellow like his father.

Kit and Mr. Garland went with the single gentleman—who was really Master Humphrey, the teller of the whole story—to find little Nell and her grandfather in the village where their life was now being passed so peacefully. When at length they got to the house, Kit was the first to enter the room in which the old man sat looking into the fire—but he sat alone. In an inner room Nell lay sleeping, he told them, and after a long time they followed him to her room. Her sleep was indeed a long one, for she was dead. "Dear, gentle, patient, noble Nell was dead. Her little bird—a poor, slight thing the pressure of a finger would have crushed—was stirring nimbly in its cage, and the strong heart of its child-mistress was mute and motionless for ever." Not long afterwards the old man followed her to the grave, and so ends the story that began in the Old Curiosity Shop.

THE COMPANY IN THE MAYPOLE INN ONE STORMY NIGHT OF MARCH, 1775

THE STORY OF BARNABY RUDGE

IN the comfortable Maypole Inn, on the border of Epping Forest, there was assembled round the fire one stormy night of March, in the year 1775, an oddly-assorted group of men, drinking and smoking. Of the company only one was a stranger. He was a weather-beaten fellow with a rough, grizzly beard, and an ugly wound on his face. After a while this stranger asked the company about a house which was within a mile of the Maypole, and thereupon old Solomon Daisy, the parish clerk and bellringer, told the story of the Warren, as the house was named, and here it is.

Twenty-two years before it had been the property of a Mr. Reuben Haredale, a very rich man. His wife died and left him with a daughter scarcely a year old; and, feeling lonely, he went to London for several months. On his return he brought back with him two women-servants, a steward of the name of Rudge, and a gardener. The bellringer of Chigwell, a village near by, had been alarmed that very night by the sound of a bell, just as he was about to toll the church bell for an old man who had died that day. In the morning it was found that Mr. Reuben Haredale had been murdered in his bed, and in his hand he held part of a rope connected with an alarm bell which rang on the roof of the Warren. His gardener had disappeared, and months afterwards the supposed body of the steward, Rudge, was found in a pool in the grounds, scarcely recognizable save for his clothes, ring, and watch. A large sum of money had been taken, and people naturally believed that the gardener had committed the double murder in order to steal his employer's money. The Warren was now tenanted by Mr. Geoffrey Haredale, brother of the deceased man, who watched with jealous care over his niece, Emma Haredale, the child who had been born there, now a beautiful young woman.

SIR JOHN CHESTER AT HIS EASE

When the sullen and mysterious stranger had heard this story, he immediately set out for London on horseback, giving Joe Willet, the son of the Maypole landlord, a savage cut with his whip as he rode away. When well on his journey he picked a quarrel with a traveling locksmith, named Gabriel Varden, with whose vehicle his horse had collided in the dark. Gabriel, after this encounter, went on to the Maypole, where he was well known, and had some gossip there about the strange man before he resumed his journey to London. He could see the city becoming visible as dawn approached, when he was startled by a cry for help hard by. On the ground there lay young Edward Chester, Miss Haredale's lover, and round him circled a crazy boy, none other than Barnaby Rudge, the son of the dead steward of the Warren. Gabriel and he conveyed the young man to Mrs. Rudge's little house, and with careful nursing he was soon restored to life and health. When Gabriel went back the next day to inquire for Mr. Chester, he was talking to the widow just as someone knocked at the window. Mrs. Rudge went to the door, and in a moment Gabriel heard her call out in horror and surprize. The locksmith rushed to her aid, and was surprized to see the stranger he had met the preceding night. He would have caught him, but the widow clung to him until the man escaped. She explained that this man held other lives than his own in his power, and between them there existed a secret which she dared not breathe. Later on Mrs. Rudge went to Mr. Haredale, telling him she must leave her house to become a wanderer, and refusing to touch again any of the money he allowed her every year.

Now, Edward Chester's father, Sir John Chester, was the bitter enemy of Geoffrey Haredale, having even hinted that Mr. Haredale was his own brother's murderer, and in a strange interview which they had at the Maypole one night each agreed that he would do his best to keep the lovers apart; Sir John was to restrain his son, and Mr. Haredale to reason with his niece. Sir John next told Emma that his son was not true to her, which she refused to believe, and afterwards he told Edward that he was to give up Emma, as he must marry an heiress, because they were already greatly in debt. The young man hotly resented this, and his hypocritical father at once disowned him, and Edward went to the West Indies to seek his fortune. At the time that the father cast off his son, Joe Willet did the opposite, and left his father. He could no longer endure being treated as a boy, and after bidding farewell to Dolly Varden, the locksmith's charming daughter, he enlisted

DOLLY VARDEN TAKES EDWARD'S LETTER TO EMMA

in a regiment about to go abroad. Dolly became the companion of Miss Haredale when both their lovers had left England.

Five years passed away. The landlord of the Maypole Inn had been told by the bellringer that he had seen the ghost of a murdered man appear to him on the anniversary of the very night on which Mr. Reuben Haredale had been killed, and honest John Willet thought he ought to let Mr. Geoffrey Haredale know of this. He went to the Warren with his news, accompanied by Hugh, his ostler, a rough fellow, but handsome after a wild gipsy fashion, and of great strength. As they were returning they were accosted by three horsemen, who asked if they were on the right road to London. When they knew that it was thirteen miles away, they next asked if there were any inn near, and ended by following John and Hugh to the Maypole. These men were Lord George Gordon, his secretary, and his servant. Lord George was a strong Protestant, and when, in 1780, some laws were proposed to improve the position of the Roman Catholics in England, he determined to contest these laws at all costs.

He roused up the people with his fiery speeches, until the cry of "No Popery!" was heard wherever he went. At this time he was waiting until the moment was favorable for raising a rebellion. The men who joined him were not always men who cared at all for religion; many of them were merely anxious for a fight, others had different purposes to serve. His own secretary had been a Roman Catholic, but had changed his religion to suit his own ends, and poor, weak Lord George was little more than a tool in his hands. Ned Dennis, the hangman, was on their side, and the lawless Hugh soon joined them. By tempting witless Barnaby with their badge, a blue cockade, they won over that crazy young man, who loved finery of any description, and now, wherever they went, Barnaby went also, carrying in a basket his pet raven, Grip, of which he was very fond. This strange bird had a stock of phrases which he produced on all sorts of occasions, and now he added "No Popery!" to his cries of "Polly, put the kettle on, we'll all have tea," "Grip, the wicked," "Bow, wow, wow!" and others.

BARNABY JOINS THE "NO POPERY" MEN

VARDEN DRESSING FOR THE VOLUNTEER PARADE

Lord George Gordon presented a petition to Parliament against the repealing of the Catholic laws, and in Westminster his followers gathered. These men became uproarious after a time, until the Riot Act was read, the horse-soldiers galloped in amongst the crowd, and many of the rioters were taken to Newgate Prison.

Not long afterwards, Hugh led the men out to the Maypole Inn, where they broke everything on which they could lay hands, drank freely of all the spirits, and finally left John Willet, the fat little landlord, tied to his chair, next making their way to the Warren. Hugh was mindful of certain orders Sir John Chester had given him, and the beautiful old house was fired, and soon became a smoking ruin. While John Willet remained fixed to his chair at the Maypole, staring vacantly and wonderingly around, a man came in and asked which way the rioters had gone. This man was none other than the sullen stranger who had been there five years before.

As he was leaving the inn, he stopped at a sudden sound—that of the bell from the Warren. It sounded deep into his heart, and he hastened to the old house, hovering about it like a dreadful bird of prey. Presently Mr. Haredale came upon him and threw himself on the man, clutching his throat with both hands, calling him by the name of Rudge, murderer and monster! And, indeed, it was none other than the faithless steward who had murdered his master and the gardener, had dressed the latter up in his own clothes, and had then escaped. His existence had been the secret which the poor widow was obliged to guard, while he extorted money from her, following her wherever she went.

POOR BARNABY IN NEWGATE PRISON

In his cell in Newgate Prison, Rudge explained to a former comrade that he had been unable to stay away from the Warren; that the dead man seemed to draw him there as if he were attracted by a magnet. In this prison, too, poor Barnaby, who had been arrested while acting with Lord George's followers, first met his father. After some time the Gordon rioters burned down the building to procure the release of their friends.

Barnaby and his father, escaping, wandered out into the country, but when the murderer Rudge became ill Barnaby went to find Hugh, and was just in time to see him knocked off his horse in the midst of a crowd in Holborn. Hugh was able, however, to accompany Barnaby to the hiding-place where Rudge was lying, but the next day they were all captured by soldiers, whom Dennis the hangman had told about their escape, when he himself was arrested.

Meanwhile, both Emma Haredale and Dolly Varden had been captured by some of the riot leaders who burned down the Warren and taken to London. Their friends were searching for them far and wide. How delighted they were when they were discovered by Mr. Haredale and Gabriel Varden, the latter of whom had become a sergeant of the London Volunteers at this troublous time. But they were even better pleased to see with them Edward Chester and Joe Willet, even though the latter had come home with only one arm, having lost the other at the defence of the Savannah.

The murderer Rudge, Hugh, and Barnaby were all condemned to be hanged. Hugh's last wish was that he might save Barnaby, as he was sorry for the poor, half-witted boy. As Barnaby was mounting the scaffold, a messenger came with a reprieve for him, which his friends had secured, having spent the whole of the previous night in the effort, honest Gabriel Varden having tried even to see the king on his behalf.

Lord George Gordon was imprisoned, and died at Newgate in 1793. In a duel Mr. Haredale killed his old enemy, Sir John Chester, and afterwards fled the country, dying in a monastery abroad. Edward Chester married the beautiful Emma, and they sailed to the West Indies, where he had amassed a fortune. Joe Willet married Dolly Varden after all, and when he inherited the Maypole Inn, Mrs. Rudge, with Barnaby and the faithful Grip, came to live with them, and the poor youth's mind grew clearer with advancing years.

THE NEXT STORY OF BOOKS IS ON 2861.

WHAT THIS STORY TELLS US

WE have already learned in the previous article on this subject something of the Indians as the first settlers of our country found them. We read of their appearance, their dress, their methods of fighting, how they got their living, and began to tell of some of their strange customs. Now we come to that strange figure, the "medicine-man," who was supposed to have power over disease and misfortune. We shall also learn something of the way the Indians were treated by the white men in old times, and also of their life to-day, for many Indians still live in various parts of the Dominion of Canada.

THE INDIANS OF CANADA

PART II

CONTINUED FROM 2579

THE Indian had a firm faith in dreams. He was advised in his dream where to go and what to do; the individual's own ability or intelligence counted for little; he received his power in dreams, and when in doubt he slept, hoping to receive knowledge. He believed, too, in magic, and as a result each tribe had its sorcerers or conjurers or "medicine-men." They believed illness of the body meant possession by an evil spirit, and their methods of healing took the form of incantations and strange ceremonies for exorcising this spirit.

The medicine-man was a combination of magician and doctor. The tribe believed that with his magic art and his incantations he could heal the sick, cast out evil spirits, or control the weather. His medicine-bag contained many herbs and roots, and charms known only to himself. He practised his "sorcery" in a special tent of small size, in which he invoked spirits of all sorts, using not only the contents of his medicine-bag, but drum and rattle, while he groaned and chanted his weird songs. When asked why he used the noise of drum and rattle in an effort to heal the sick, a medicine-man said that he followed the example of the Great Spirit, who healed the flowers and trees in the summer with the thunder and the rain. The noise of the drum and rattle, he said, was like the roll and rattle of the thunder, and the medicine was like the rain which refreshed the thirsty plants. A great deal of faith was placed in the successful healer, and his herbs, roots, bones, rattle and songs were held to be possessed of mystery, and so were the means of driving out disease. Some of the medicine-men were really skilful in their use of herbs; but they had not even a rude knowledge of surgery.

There are many tales and traditions of the medicine-man's power of transformation, his ability to cast spells or to injure by a "curse," to sink into the earth, communicate at a distance, fly through the air, travel underground, remain under water, and become invisible. Sometimes he claimed to have the power of prophecy; he foretold if the sick would recover, if a journey would be prosperous, if a raid would be successful, where game would be found, what was going on among a distant people. Sometimes he showed how deft he was in sleight-of-hand performances, like a modern magician,—how he could handle fire without being burned, and how skilful he was in all sorts of tricks. These medicine-men or wizards were naturally determined opponents of the early Christian priests. The Indians also believed in witchcraft, but to a limited degree.

SOME INDIAN GAMES AND SPORTS

Although the Indians were stoical and rarely gave external evidence of

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their true feelings, they were not without a sense of humor. Among their legends and traditions are many funny stories. They had many games and amusements. They were fond of a sort of game of draughts or checkers; they had dice made of bone which they cast on a wooden plate; and references to games and gambling occur often in their legends. They also had a kind of football game, lacrosse, and other rough and strenuous games of ball. There were several forms of the "throwing stick," and the object sought for in them all was distance. Story-telling was a favorite pastime. They had a number of strange dances and festivals. One of these was the Smoke Dance when a new peace pipe was consecrated, and another the potlach or giving away dance, during which the Indians who took part gave away valuable presents. Singing was one of their favorite amusements.

Musical instruments were made of hoops with pieces of hide stretched over them to form drums or tambourines or "tom-toms;" these and wooden sticks were their only instruments. Their music was simple, consisting only of a few musical phrases repeated over and over. The Indians had love songs, festival songs, war songs, hunting songs, and songs associated with every phase of their life. Many of these songs have been saved by collectors. Children had rattles, dolls and other toys. The old Indians—men and women—smoked a great deal; their pipes were of hollowed-out stone with wooden stems. The pipe of peace was a long sacred pipe used only at peace-making. At the peace conference it was passed from chief to chief, each drawing one breath before passing it on. It was a token of friendship and good feeling. The peace pipe was a treasured possession and was kept carefully wrapped in soft deerskin and fine furs.

The highest limit of art among the early tribes was reached in the pictography or pictures on birch-bark, in bark adorned with the dyed quills of the porcupine, in vari-colored basketry, and in painted designs on skins or hides. Some of the tribes had picture writing; they made use of rude pictures drawn on birch-bark to express thoughts. In most cases these pictures were very realistic representations; they told the incidents of a hunt or the episodes of a myth or legend. The signs did not always convey the same meaning to members of the whole tribe. Some of the tribes had characters or hieroglyphs to express words or ideas or groups of ideas, but they had no written language.

THE NORTH AMERICAN INDIANS NOT ALWAYS CRUEL

It is wrong to suppose that the early Indians of Canada were always cruel and wicked and savage. They were, of course, molded by conditions of the wilderness, by a long and continuous struggle with nature, by constant contact with wild life. But although they were ignorant and superstitious, passionate and revengeful, and at times cruel to their enemies, and proud with a lust for conquest, they had many noble qualities. They were never guilty of low or mean vices; before the coming of the white man with his "fire-water" and his baser habits, they had on the whole a high sense of morality. As a rule, they were kind and hospitable, faithful and honest, and they were capable of great bravery and courage; yet they had a love for liberty, and, because of their wild free life, a natural contempt for systematic rule.

These qualities have not entirely left them. There is no doubt that at first they were friends and admirers of the white men, whose designs they did not suspect. Jacques Cartier, telling of his visits to Canada in 1534 and 1535, wrote: "In St. Martin's Creek we saw a great number of the wild men; they were on shore making a great noise, beckoning us to land, showing us certain skins upon pieces of wood, but because we had only one boat we would not go to them, but went to the other side. They, seeing us flee, followed, dancing and making many signs of joy and mirth, as it were desiring our friendship. . . . They gave us whatsoever they had, not keeping anything . . . and made signs that the next day they would bring more skins. . . . As far as we could perceive and understand this people, it were an easy thing to bring them to some familiarity and civility, and to make them learn what one would."

WHY THEY GREW TO DISLIKE THE WHITE MEN

Soon, however, the Indians became suspicious, and mistrusted the European visitors. Cartier kidnapped a chief and took him to Europe; then the fur traders deceived them, and took their territory,

INDIANS AS THEY LOOK TO-DAY

These squaws of the Coast Indians, living near Vancouver, do not look much like the beautiful Indian maidens of whom we read in poems, though some of them are young. Perhaps they would look better in Indian dress, for it takes time to learn to wear strange clothes without awkwardness. They seem good-natured, though some of them have endured much hardship, and they have intelligent faces.

These Montagnais Indians in the Lake St. John district have given up many of their old customs. Nearly all of them are Christians. Their reservation is on high land near the lake, and the country to the north of them is not well known. Here again they appear awkward in our dress. The men make excellent guides and boatmen, and are skilful fishermen. Notice the canoe in which the little ones are seated.

Photographs by Notman, Montreal.

and made them the victims of commercial greed. The sixteenth century was a period of intermittent warfare between the white settlers and the Indian tribes, and the early immigrants were in constant terror because of the sudden and secret Indian raids upon them. In the seventeenth and eighteenth centuries, there was greater friendship between the Indians and the French or the English.

In the Maritime Provinces the French immigrants were kindly received by the natives and allowed to settle on their lands without objection, and friendly relations were established and maintained with few interruptions. This friendship was due largely to the numerous marriages of Frenchmen with Indian women. In the wars between the English and the French for the possession of Canada, which ended in 1759, the Indians had a very large part and influence, and had they been united they could have expelled the white invaders. Frequently they held the balance of power between the two nations, and because of their knowledge of the country, and of forest fighting, and their skill on the lakes and rivers, their assistance was eagerly sought. Roughly speaking, the Algonquins and Hurons helped the French, while the Iroquois and some smaller tribes helped the English. After the Iroquois in their cruel tribal wars had practically destroyed the Hurons, they attacked the French, and several times they brought the white settlements along the St. Lawrence to the verge of destruction. The story of The Girl Who Held the Fort, told elsewhere, gives an idea of those perilous times.

The Indians had many famous warriors and leaders. Among these is numbered Pontiac, who, in 1763, formed the famous project of uniting several Indian tribes against the British. He was a man of great genius, shrewdness, and cunning. Another famous warrior was Tecumseh, who fought for the English in the War of 1812, and was killed at the battle of Moraviantown in 1813. He, too, was a remarkable man, famous for his courage, his eloquence, and his skill as a leader in battle. After the fall of Quebec and the end of hostilities between the French and the English, the Indians of Canada dwelt in comparative peace, except for attacks in the late eighteenth century on greedy and dishonest traders, and on colonists who treated them harshly.

EARLY ATTEMPTS TO CHRISTIANIZE THE INDIANS

The first attempts to civilize the Indians were made by the Jesuits. The black-robed missionaries spread over Canada at an early date among the Iroquois and the Hurons. They were not always kindly received; they suffered many hardships, and many of them were tortured and put to death by the Indians to whom they brought the Gospel. Brébœuf is one of the most famous of their martyrs. Missionaries from other churches and orders spread amongst them, and slowly the majority of the Indians became Christianized. To-day most of the formerly pagan Indians have joined one or other of the Christian denominations, and although some keep to the superstitions and customs of their forefathers, there is every indication that in a few years the whole native population will be converted to Christianity.

WHERE THE INDIANS NOW LIVE

Nearly all the Canadian Indians now live on "Indian Reservations,"—tracts of land given to the tribes by the Canadian Government in return for the territory taken from them at the beginning of colonization. They are not confined to these reservations, but are allowed to roam and hunt at will, subject to the white man's laws; the reservation, however, is the recognized and undisputed home of the tribe settled upon it. Here are the small houses or tents of the people, usually a school, and sometimes a church. Members of the tribe, too, have blocks of land which they cultivate; they follow a civilized mode of life, although they still retain many of their old beliefs and customs. They are under government supervision, through a white Indian-agent or supervisor, and they receive an annual grant of money, provisions, blankets, and seed-grain according to their needs. A few in the far north still wander as of old, without a permanent reservation.

The Indian tribes extend to-day from the Atlantic to the Pacific. The principal remaining tribes are the Micmacs and the Malecites in the Maritime Provinces, and the Abenakis, the Montagnais and the Algonquins in Quebec. The Hurons, once a very powerful race, have but a small remnant, less than three hundred, at Lorette, near Quebec City; the ruins of their forts may still be seen in the rich farmlands between Lake Simcoe and the Georgian Bay. The Six Nations are in Ontario and Quebec. Numbers of the Six Nations of the Iroquois tribe, who lived in New York State before the Revolution, went up to Canada when the war was over, and were given large grants of land. Some of them settled near Kingston. Others went farther west to the Grand River. These Indians are farther advanced than the other tribes and many of them have comfortable houses and fairly well tilled farms. The Ottawas and Delawares are in Ontario; the Ojibways and Chippeways are in Ontario, Manitoba and the Northwest. The Crees are the most numerous; four-fifths of them are in the Northwest, and the remainder are in Manitoba, Ontario and Quebec. The Blackfeet are in Alberta; the Slaves and Dog Ribs are along the Mackenzie River; and in British Columbia there are many distinct tribes.

HOW THE INDIANS ARE LEARNING TO LIVE LIKE WHITE MEN

The Indians in Canada to-day are a quiet and peaceable, law-abiding people. Like most ignorant races, however, they are easily stirred up, and they sometimes talk unreasonably about their rights and privileges, and about the freedom they have lost. As they are brought more into contact with civilizing forces, they continue to give evidence of increased self-reliance and industry. Their children go to school, and learn readily. As a rule, they are hardy, although, because of their small houses, disease has spread among them. They have produced some noted runners and athletes.

According to locality, the Indians usually become cultivators of the soil, stockmen on cattle ranches, fruit pickers and packers, loggers, guides, and boatmen. Those who live by the sea or lake or river are expert in sealing, fishing, or hunting for fur; they sell the products of their labor to the whites. At times they work in saw-mills, in log camps, and in canning factories. They are also expert at handicraft, and they sell in large quantities axe-handles, tubs, rustic garden-seats, hockey sticks, snow-shoes, toboggans and other articles.

WHY THEY DO NOT PROGRESS FASTER TOWARDS CIVILIZATION

As canoemen and boatmen they are unexcelled. The women, too, are money-earners. They make bright-colored baskets, boxes ornamented with dyed porcupine quills, and beaded cushions, all of which they sell to tourists; they pick and sell great quantities of berries; they make pretty mats from the inner bark of the cedar; and they cure and dress skins, from which they make gloves and beautiful beaded moccasins. Yet the Indians in their labors are not systematic; they naturally despise rules; they work in fits and starts, and they dislike hard or continuous physical effort. The problem of making a living has always been a very easy one with them, and as a result they work only long enough to get a certain amount of food and clothing; then they stop, and work again only when this food has disappeared. There are, of course, exceptions; many are very industrious; some, too, qualify to be teachers in the government schools of the tribes. There have been professional men among them.

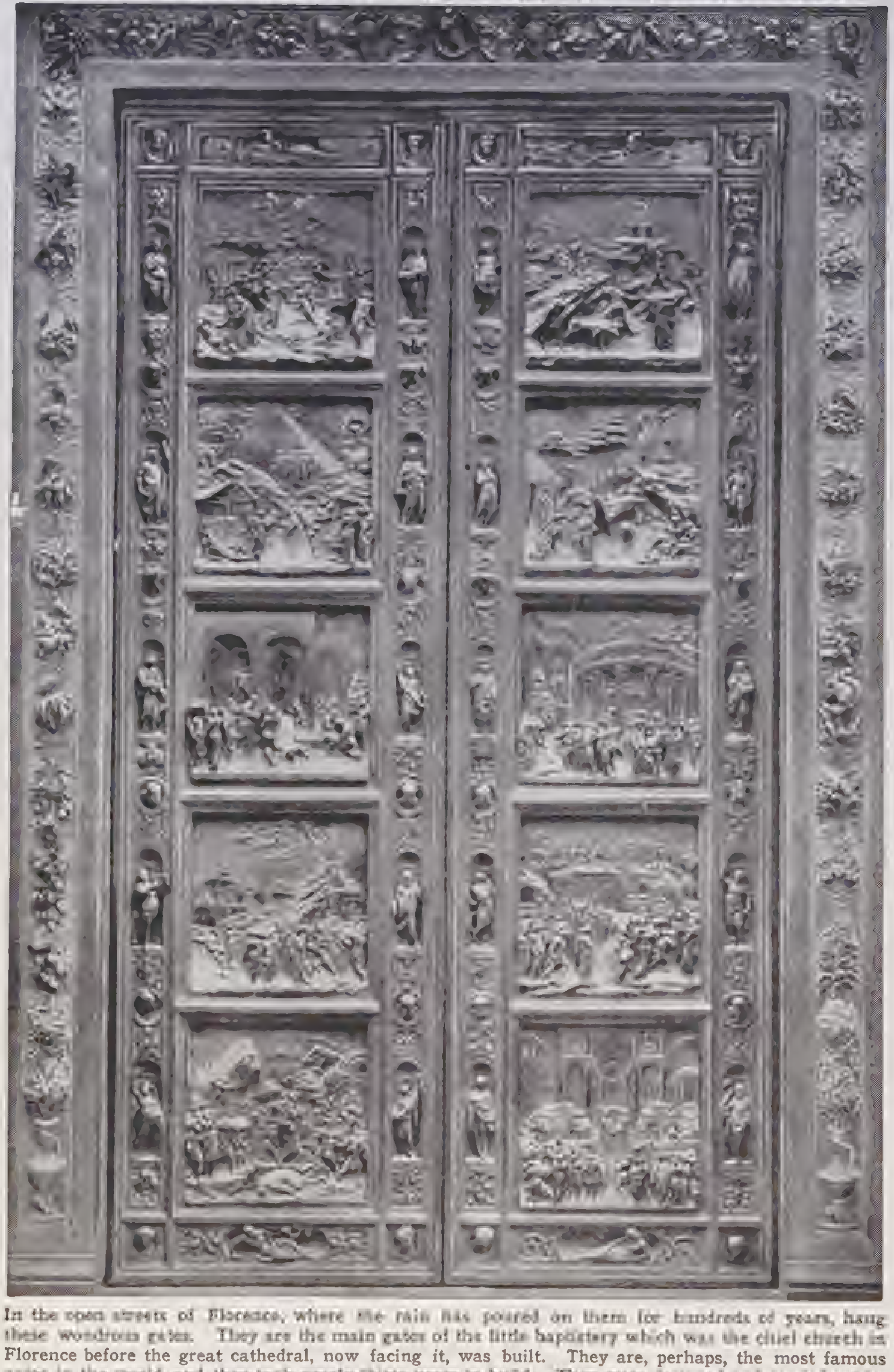
The Indians we see to-day in our towns and villages, in forest or on lake or river, are descendants of a once mighty people who had a great influence in the early days of our country. They have greatly decreased in numbers, but under the forces of civilization they have made very wonderful progress. In 1912, over eleven thousand Canadian Indian children were in attendance at industrial schools; the Canadian Indians had nearly sixty thousand acres of land under cultivation, of which the total production amounted to nearly a million and a half dollars; and wages and the proceeds from various industries amounted to nearly two million and a half dollars.

WHAT WILL FINALLY BECOME OF THE INDIAN RACE

The Indians in Canada in 1911 numbered slightly over one hundred and three thousand. Disease, because of the unsanitary conditions of their dwellings, will gradually diminish them. On account of their intermarriage with the white people, they will become absorbed in other races, and years hence, because of death and absorption, it will perhaps be hard to find a full-blooded Indian as our ancestors knew him in the early pioneer days of our country. In time the Canadian Indian will vanish from the earth. But he will have left his stamp deep on the pages of Canadian history, and he will not be forgotten.

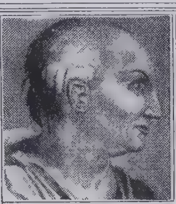
THE NEXT STORY OF CANADA IS ON PAGE 2877.

THE BEAUTIFUL "GATES OF PARADISE"



In the open streets of Florence, where the rain has poured on them for hundreds of years, hang these wondrous gates. They are the main gates of the little baptistery which was the chief church in Florence before the great cathedral, now facing it, was built. They are, perhaps, the most famous gates in the world, and they took nearly thirty years to build. They were designed and carried out by Lorenzo Ghiberti, who began them in 1425 and finished them in 1452. Michael Angelo thought them fit to be the gates of Paradise, and they are among the most wonderful things in a wonderful city.

DONATELLO


GHIBERTI

CIMABUE

BRUNELLESCHI

DELLA ROBBIA

GIOTTO

THE BUILDERS OF FLORENCE

CONTINUED FROM 2718

DONATELLO'S ST GEORGE

AMONG the many cities of Europe that we desire to visit, none calls to us more clearly than the ancient city of Florence, which lies in the lovely valley of the Arno. An old legend says that it was built by Julius Caesar, who called it Fiorenza, and though learned men say that this is only a pretty tale, we know that the city was founded by the Romans.

Italian cities commenced the struggle against feudalism early in the Middle Ages, and cities such as Venice, Genoa and Pisa became powerful states. Florence was slower to rise. Fiesole, on the mountainside above her, and the castles of the nobles round about, were for centuries too strong for her. But in the twelfth century, the citizens of Florence were able to overthrow the people of Fiesole, and soon became so strong that they were able to ruin the strong places of the nobles, and compel them to live within the walls. After that the city was time and time again convulsed by party strife, for the nobles, who were banded into a faction called the Ghibellines, tried to impose their will upon the citizens, who were called the Guelphs. But at length, the power of the nobles was broken. Every trace of serfdom was destroyed, and the government of the city was placed in the hands of the heads of the great guilds, as representatives of the people of the city.

The guilds of the Middle Ages were the associations, or unions, in which the citizens united for protection. Every citizen, whether he was occupied in the arts or in some trade, belonged to a guild, and many guilds brought great fame to their cities. Florence was noted for its cloth and furs, its silk, its gold and silver brocades, and especially for its bankers. Representatives of the great guilds were sent to every capital in Europe, and in the days of its early glory, two hundred years and more before Columbus was born, it was the home of great artists and learned men. In spite of many misfortunes, Florence was enormously wealthy, and it was natural that men who loved their city, who had fought for it, and whose fathers had died for it, should turn their attention to making it beautiful.

We marvel at the beauty they have left us, and it adds to our amazement to remember that when she was made beautiful Florence was already centuries old. The wonderful thing is that the city found ready, in the course of

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no very long time, the men capable of carrying out, in the best possible way, the high ideals from which the search for beauty grew. Architects and sculptors arose whose works have seldom been excelled in the history of the world. Many of them sprang from such humble circumstances that we do not know their early history.

HOW ARNOLFO BEGAN THE GREAT WORK OF MAKING FLORENCE BEAUTIFUL

One of these men of humble birth is Arnolfo di Cambio. We meet him first in the company of a band of workmen who were engaged with him at work in the cathedral of Siena. He was still a young man, having been born about 1232. With him was a man named Lapo, whom he sometimes called his father and sometimes called his teacher. All these workmen were skilful artists, going from town to town in Italy, beautifying existing buildings or putting up new ones. It was Arnolfo that Florence chose to begin her great work of beautifying the city. The young workman became suddenly renowned as an architect and sculptor, and while similar tasks were being attempted in the neighboring cities, he went swiftly to work to give Florence some of the buildings which to this day help to make her famous.

He was the father of her architecture. He surrounded the city with stately walls, he built her noble cathedral and two of her most beautiful churches, and he planned the famous public palace of the city, where the governors of Florence held their meetings. But Arnolfo could not finish all the great works that he began. He died in 1300, leaving much for those who followed to complete.

HOW CIMABUE BEGAN PAINTING REAL PICTURES AND FOUND GIOTTO MINDING SHEEP

While Arnolfo was creating wonders in stone, a Florentine named Giovanni Cimabue, born in 1240, was adding to her pictorial treasures. The art of painting had at this time fallen very low in Italy. Foreigners, who copied bad models, ruled the world of art. Cimabue began, as other young artists began, by copying these unsatisfactory models. Soon, however, his independence made him strike out for himself, and to paint men and women and the things about him as they really seemed. Because he tried truly to paint as he saw things, he is honored with the title of the Father of Modern Painting. He died two years after Arnolfo, in 1302. But before he died he had trained a greater than himself to succeed him. This was Giotto di Bondone, always called simply Giotto.

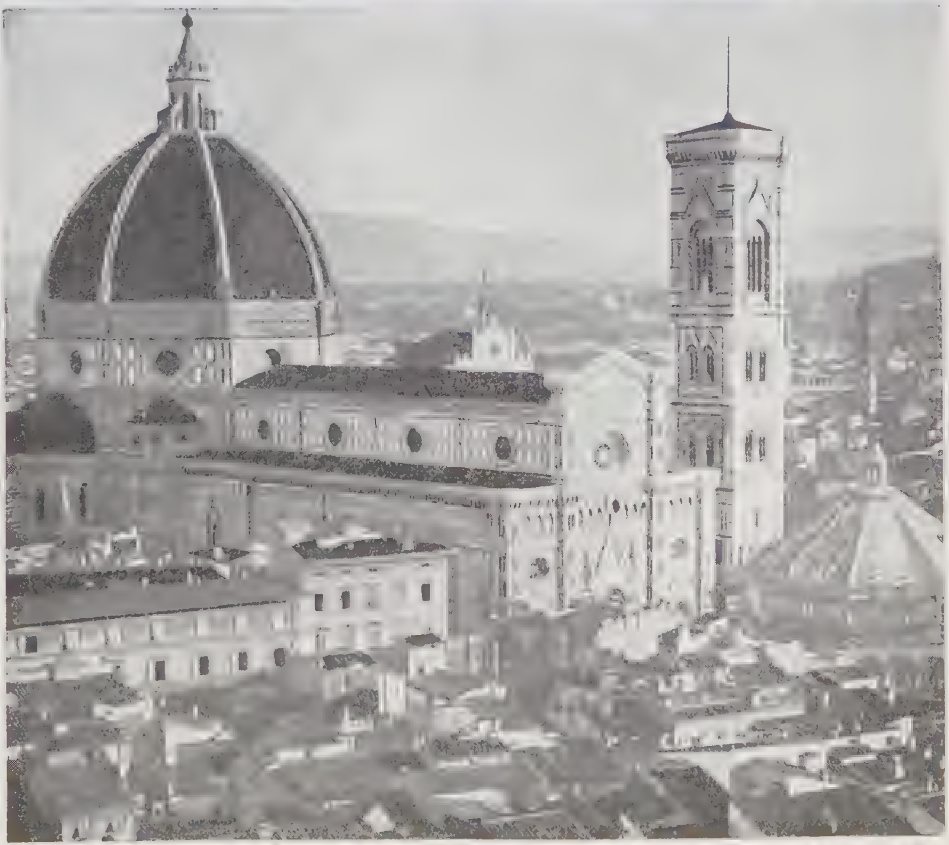
Giotto was born in, or about, 1266, the son of a peasant at Vespignano, near Florence. While he was still a little boy, Giotto was placed by his father with some shepherds to watch his flocks. Giotto may have been a loving shepherd, but he loved art better. Without having had a lesson, he used to give all his leisure to drawing on the rocks with chalk. It is said that while thus engaged one day making a skilful drawing of a sheep, Cimabue found him. The great artist, pleased at the boy's industry and talent, asked if he would like to go with him and learn to paint. Permission having been gained from the boy's father, Giotto was taken to Florence and instructed by his good friend. Giotto proved a ready pupil. He learned all that Cimabue could teach him, and became greater than his master.

GIOTTO, THE LAUGHING ARTIST WHO TALKED MERRILY WITH A KING

Cimabue had paved the way for a great change in the methods of artists; Giotto was really the first to give it expression. He was about twenty-four when he gained his first important commission. This was to paint a picture of Paradise over a church altar. An interesting thing happened about this. Dante, the great poet of Florence, was at this time living in his native city, and had shown himself a friend of the young artist. So, as Giotto sat perched high up on his little platform near the roof of the church, he thought of what he owed the poet, and showed his gratitude by painting a beautiful portrait of Dante among the angel faces of his picture. That portrait is the finest of the great poet that we have, for it was painted before sorrow and care had marred the noble features of Dante.

Giotto's talent was speedily recognized. He was paid to do paintings for the famous church in which St. Francis of Assisi is buried; for churches at Rome, Padua, Verona, Naples, and elsewhere, and, of course, for many in Florence.

THE VERY GREAT HEART OF FLORENCE



Florence has grown up, as it were, in the bottom of a basin, with majestic hills rising round about it as if to defend it from the rest of the world. When the people had won their way to freedom, their love of beauty burst forth, and a school of great artists arose. The citizens still lived simply. They used their wealth in beautifying the city, and one artist vied with another in its adornment. Because the people had faith that the place where they worshipped was the House of God they used their best efforts in making it worthy of its name, and churches and towers and domes began to rise ; and there grew up the wondrous sight we see in these photographs—the great black and white marble cathedral with the wonderful dome, the quaint little baptistery in which for a thousand years every child of the Florentines has been taken to be baptized ; with the towers and roofs of the little crowded red-tiled city packed closely round about.

Wherever he went he was always the simple laughing peasant turned artist. He had a merry jest for everybody, whether it was king or clown. Said a king who employed him: "I wouldn't work upon that scaffold this hot day if I were you." "Nor would I if I were you," answered the laughing artist.

HOW GIOTTO MADE A PLAN FOR THE POPE AND WENT TO ROME

On another day he and a great lawyer were caught in a storm, and as they went their way, drenched and plastered with mud, the lawyer turned to Giotto, and, noting how comical he looked, said: "Do you think that anybody seeing you at this moment for the first time would believe that you are the greatest painter in the world?"

"Yes," said Giotto, "if he could believe that you knew your A B C."

Another joke of Giotto's is told at the expense of the Pope. The latter sent a great man round to all the cities to collect specimens of the work of the artists, saying that the painter whose work he liked best should go to the Vatican to carry out a great scheme of decoration. The other artists were anxious to show the best thing they had done; but Giotto was not at all concerned. He took up his brush, dipped it in red, then drew with it a circle, so perfect that it looked as if it had been drawn with compasses. "Here is the drawing," he said, handing it to the envoy.

"Am I to have nothing but this?" gasped the man.

"That is enough, and too much," answered Giotto. "Send it with the others, and see if it is understood."

Apparently it was understood, for it is said that the Pope sent for him, and that he painted some pictures in St. Peter's at Rome.

THE BEAUTIFUL TOWER OF GIOTTO THAT STANDS IN THE STREETS OF FLORENCE

When he was an old man, only two years from the grave, Giotto was made master of the public works of Florence, and given charge of the building of the cathedral, left incomplete, as we have seen, by the death of Arnolfo, about thirty years before. Not only had Giotto now to superintend the work of others; he had to create, with measuring instrument, with hammer and chisel, as he had been wont to create with his paints and brushes. He was called upon to design a campanile, a tower in which to hang bells. He did the work with as light a heart as if it were an everyday occurrence. He planned and designed one of the most beautiful towers ever built. It is one of the marvels and beauties of Florence to-day, and visitors are proud to bring away from Florence bronze models of it. Not only did Giotto plan it, he worked with mallet and chisel at some of the carvings which adorn it. One of the carvings represents a little puppy, a puppy, it is said, which he had loved as a child when minding the sheep, and had remembered, years and years afterwards, when he was one of the most famous men in Italy.

The beloved Giotto passed to his rest in 1337, and we have now to go forward and leave the work of making Florence beautiful to artists of skill, but less famous than those whom we are considering. We take up our story again when we find in Florence three other wonderful men. These are Filippo Brunelleschi, born about 1379; Lorenzo Ghiberti, born in 1378; and Donato Di Betto Bardi, called Donatello, born about 1386.

THE GATES FOR WHICH ALL ITALY'S ARTISTS MADE PLANS

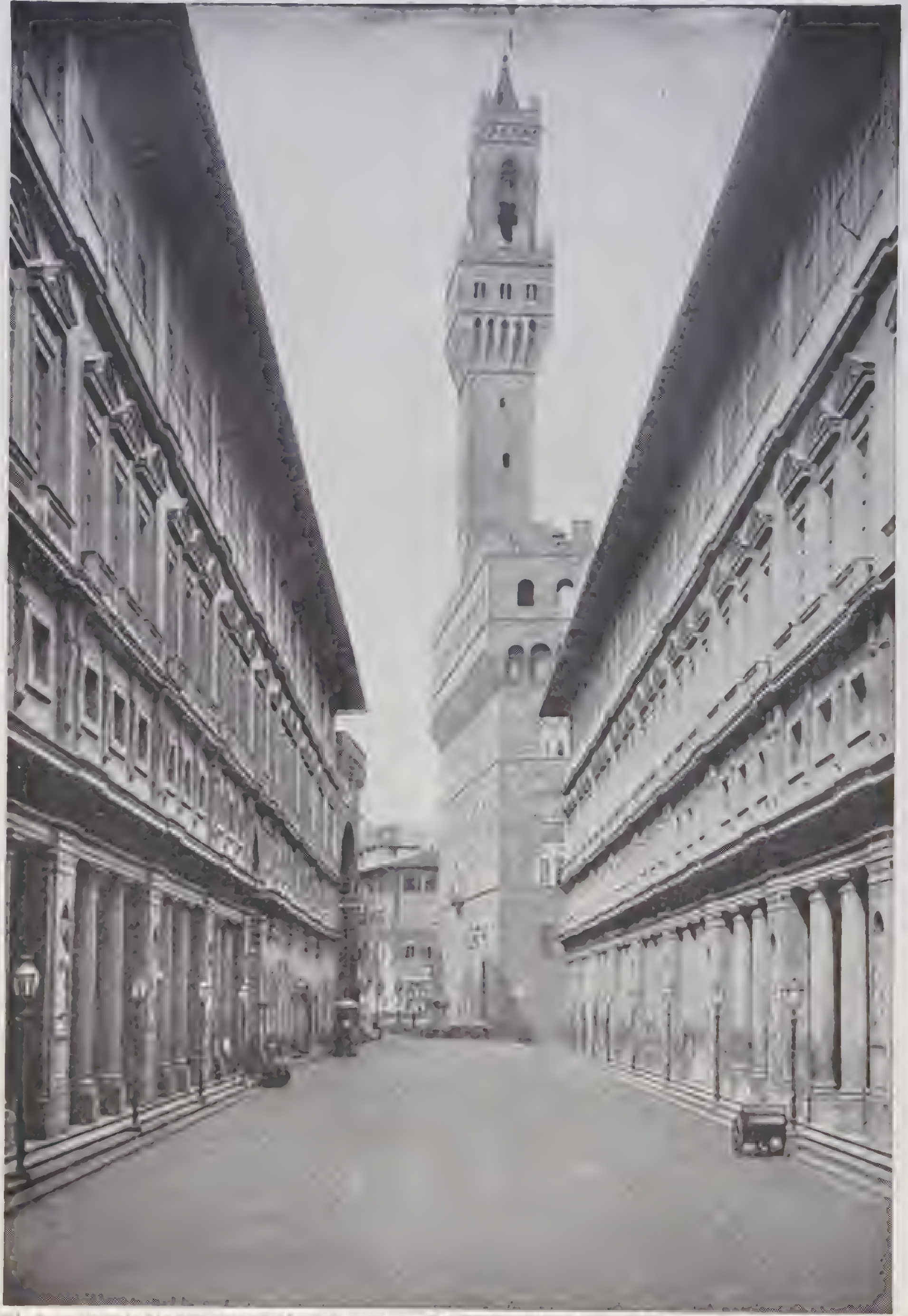
The first two came into prominence when Ghiberti was about twenty-four, and then met as friendly rivals. Ghiberti was of poor family. We know nothing about his father, but we hear of his stepfather, an excellent man, named Bartoluccio, who instructed young Ghiberti in his art as a goldsmith, then did a wise thing by sending the lad to travel and enlarge his knowledge of art, and, at the same time, to earn his living.

Ghiberti was a wonderful fellow. When he was not painting pictures he was modeling in wax, or making figures in bronze, or doing something with trinkets. Before he turned his face homeward, he had earned fame by painting some fine frescoes in a palace at Rimini. He was working at Pesaro when he got a letter from his anxious stepfather telling him that all the most skilful artists in Italy were summoned to show their genius in designing gates of bronze for the famous church of San Giovanni, the church to which all the children of Florence were then, as now, taken to be baptized. Here was Ghiberti's chance. He needed not his

GIOTTO'S DREAM OF THE LILY TOWER

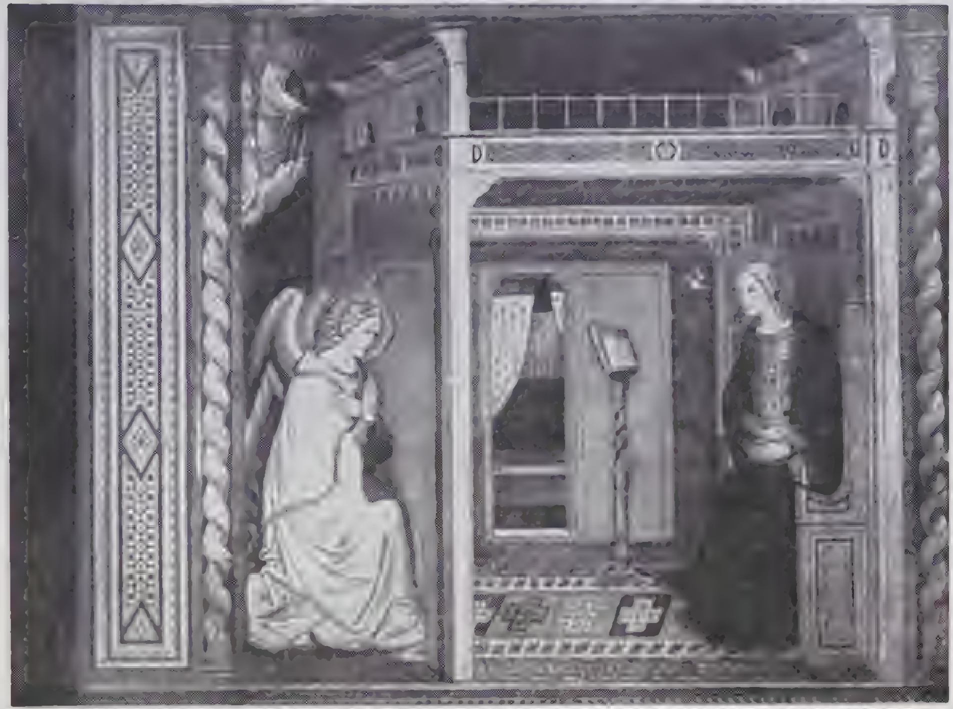
In this picture the artist has tried to show us the young Giotto minding his sheep, drawing on stone, with rough chalk for pencil, as Cimabue found him; and the artist has fancied Giotto dreaming of the beautiful tower which he was eventually to raise in the streets of Florence. As we look at the Shepherd's Tower, so pure that it is called the Lily Tower, there comes to us something of the feeling that must have been in Giotto's heart when he chiseled his marbles. The foot of this tower, says Mr. Ruskin, is the one spot out of Palestine, where we feel the dawn of the morning of the world. Behind us is the little baptistery, the last building set up on the earth by the men who learned their work from pagan teachers; in front of us is the best building set up on the earth by the men who learned their work from Christian teachers.

LOOKING DOWN A FLORENCE STREET

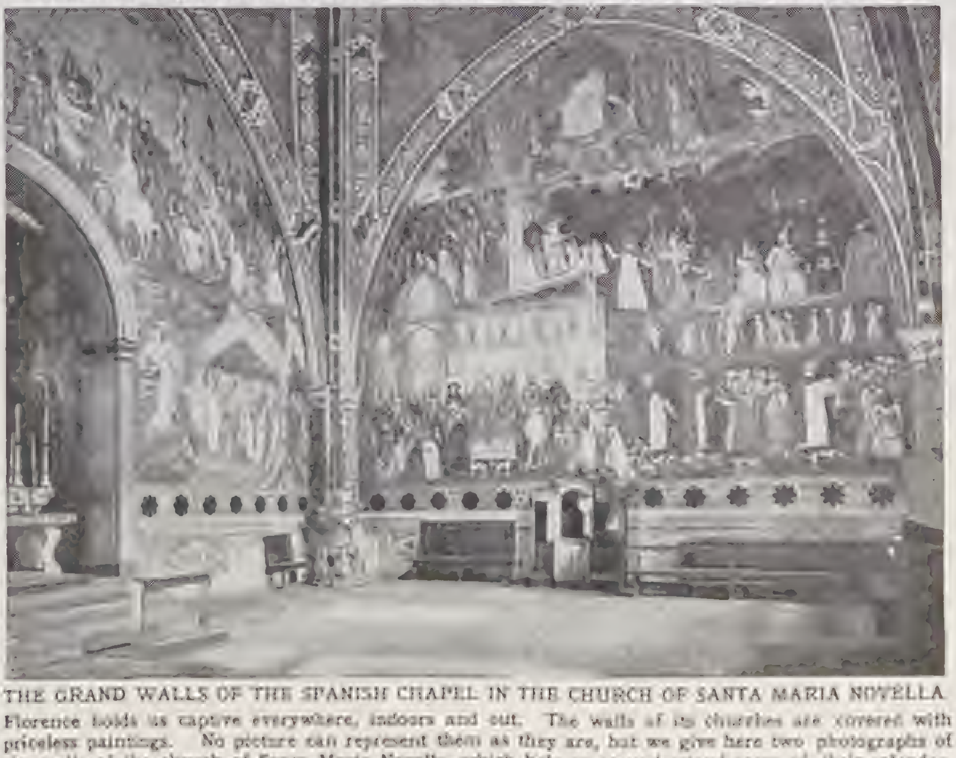


We have in this picture one of the most striking glimpses of the streets of Florence. On the right and left are the long corridors of the famous Uffizi Gallery, full of priceless paintings, and beyond, rising to a marvellous height, is the wonderful Vecchio Palace, built of huge stones hundreds of years ago. Here Lorenzo the Magnificent held his luxurious court, patronising painters and sculptors; here, in a little cell at the top of the tower, Savonarola, the eloquent monk who preached to the Florentines, spent his last night on earth. In the niches between the columns are statues of some of the great men of Florence.

THE CHURCH WALLS OF FLORENCE



THE MOTHER OF JESUS IN HER HOME, PAINTED IN THE CHURCH OF SANTA MARIA NOVELLA



THE GRAND WALLS OF THE SPANISH CHAPEL IN THE CHURCH OF SANTA MARIA NOVELLA

Florence holds us captive everywhere, indoors and out. The walls of its churches are covered with priceless paintings. No picture can represent them as they are, but we give here two photographs of the walls of the church of Santa Maria Novella, which help us to understand some of their splendor.

The photographs on these pages are by Underwood & Underwood, London, and Alinari, Anderson, Brogi, and Manelli, Italy.

stepfather's bidding to hasten home; so anxious was he to reach Florence that the journey seemed to him, as he said, like a thousand years. He drew his plan, and sent it in to take its place with the designs of the most famous men of the time.

THE GREAT CHANCE OF GHIBERTI'S LIFE AND THE USE HE MADE OF IT

Among the other competitors was young Filippo Brunelleschi. He was a lawyer's son, and his father had desired him to follow the law. But Filippo early gave his heart to the work of the goldsmith, and dearly he hoped now to win the prize. When the designs were exhibited he took with him his humble young friend, Donatello. They examined them all, and saw that Brunelleschi's was better than all save that of Ghiberti, which was superior to all the rest. And so the judges found. Ghiberti was ordered to undertake the work; this young wandering workman of twenty-four was chosen before all the other artists who competed.

To understand what Ghiberti had undertaken we must examine the picture of the gates, on page 2786, or, better still, if we cannot go to Florence, we may see a cast of them in the Corcoran Museum in Washington, or in the Metropolitan Museum in New York. It proved to be the work of Ghiberti's life. The first pair of gates took twenty years to make, and the second pair, shown in our picture, even longer. Thus fifty years of his career were given to the work. But while Ghiberti was doing the gates with the assistance of a staff of artist-workmen, he was engaged in other labors, too. He did some beautiful work for two or three churches of Florence, as well as for the cathedral; he modeled fine statues, and did some beautiful goldsmith's work.

THE GATES THAT MICHAEL ANGELO SAID WERE FIT TO BE THE GATES OF HEAVEN

Ghiberti was even given part share with Brunelleschi of the building work at the cathedral, but here as a builder he was a failure. Brunelleschi could not work with him, and had to refuse to go on unless Ghiberti were kept to work of his own; and, even when they were able to give him his own work, Ghiberti was found to be incompetent, and was removed. His grandest monument is the wonderful pair of gates, which for mingled grace and grandeur are finer than anything else of the sort in existence. Michael Angelo declared that they were fit to be the gates of heaven. Ghiberti loved the work, and he gave the best of his life to it. Though its progress was so slow, all the most exalted people in Florence were interested in it. In those days Florence was an unlighted city at night, save for the torches which people carried, and everybody not specially authorized had to be indoors by dark. But Ghiberti, though no higher in rank than the rest of the common people, became a great public character when he began the gates, and he and all his workpeople were allowed to walk about the streets at night and to carry lanterns, at whatever hour of the night they liked—a rare privilege indeed in those days.

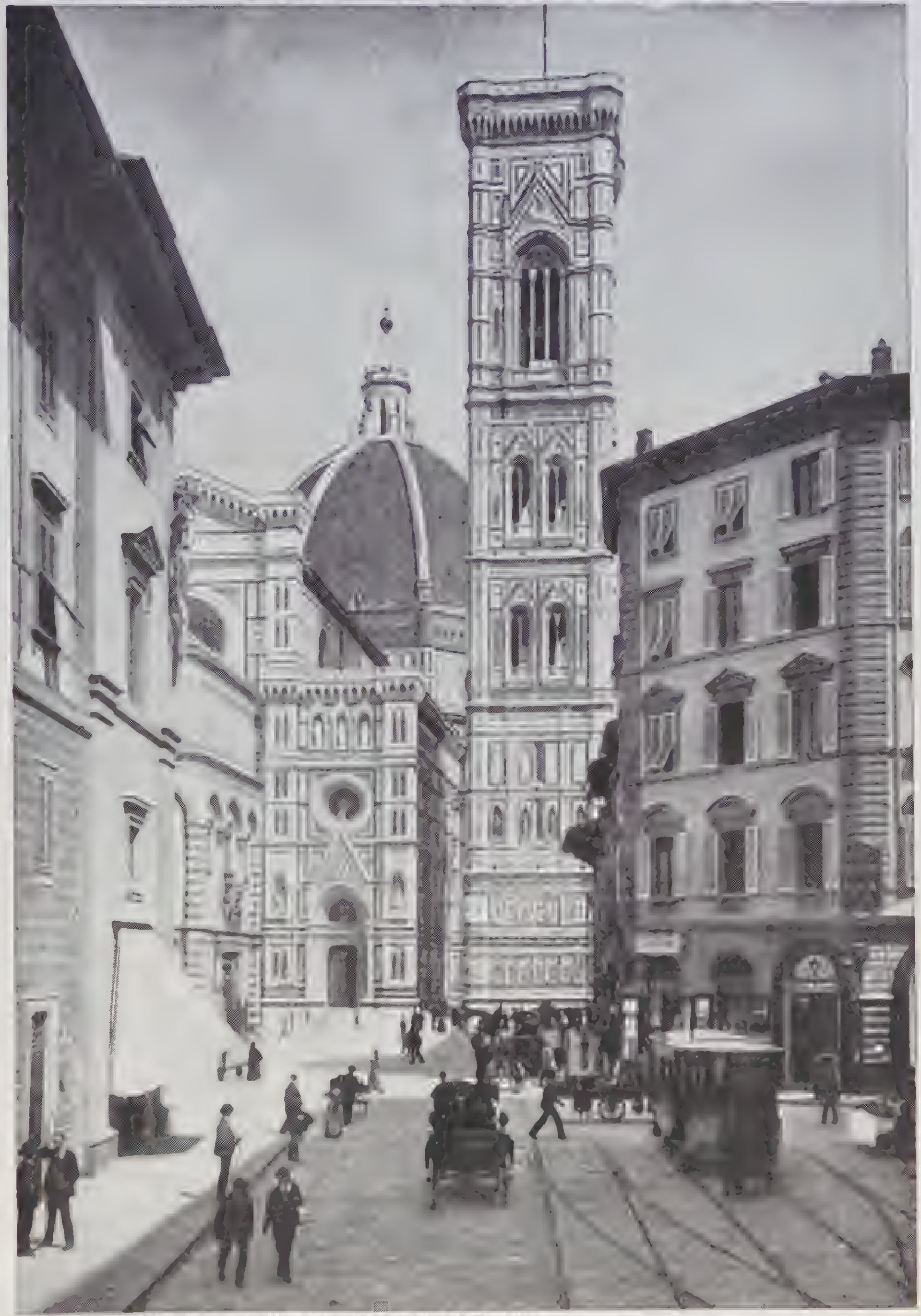
It was well for Filippo Brunelleschi that he did not get permission to make the gates, for there was other important work for him to do, even greater in some respects than Ghiberti's. Himself an ugly little man, he had a soul for beauty, though not one of the kindest of natures.

HOW BRUNELLESCHI BUILT THE DOME THAT IS STILL THE GLORY OF FLORENCE

Having failed in his contest with Ghiberti, he went off to Rome to indulge his passion for architectural drawing. He had already sketched every building in Florence, and he longed to make a new drawing showing how Arnolfo's grand cathedral could be completed by the addition of a dome. So at Rome he studied all the great buildings. He made drawings of them; he noted how they were constructed, how beauty was combined with strength, and lightness with mass. In order that he might have money to live on, he would work during the day for the goldsmiths, then at night go on with the drawings of his beloved buildings. Never did a man more thoroughly train himself for a task than did young Filippo for the dome of the Florence Cathedral.

At last, in 1417, when he was forty years of age, he returned to Florence, and offered to the city authorities plans for the building of a dome. It took the wise men of Florence several years to come to a decision. In that time every sort of objection was raised, and

A STREET CORNER IN BEAUTIFUL FLORENCE



It is a wonderful thing to walk about the streets of Florence. If we have any love of the beautiful, or any sense of the mystery of the past, there comes to us something of the feeling that poetry gives. We seem to be out of the everyday world, and in a beautiful dream. This picture shows us the wonder that bursts upon our view as we turn a street corner in Florence. We are at the famous meeting of the ways in the Cathedral Square, at what is called " the very great heart " of a city that has drawn men to it for a thousand years. All roads lead to this square, and the dome of the great cathedral and the majesty of the Lily Tower are even more impressive in this nearer view than they appear to us from the hills around.

everybody's opinion was taken. Other artists made designs, and the wildest of schemes were suggested for carrying out the work. But in the end Brunelleschi gained the day, and was told to carry out his plans. His one sorrow was that Ghiberti, who now stood high in public favor, was to share the labor with him. Brunelleschi knew that Ghiberti was quite incapable of doing the work, and felt that he himself would have all the labor, but would have to divide the honor, as well as the payment, with Ghiberti. That is why he fought against Ghiberti, and eventually got him discharged from the work.

The dome took over forty years to build, and Brunelleschi had been fifteen years in his grave when it was completed. But his plans were so perfect, his methods so excellent, and his personal labors during the last twenty-six years of his life so persistent, that the faithful band of workers who followed him had but to carry to the obvious end what he had begun, to make his work one of the grandest features in the architecture of Europe. He crowned with a dome of grace and splendor the majestic cathedral begun exactly 150 years before the dome was finished. Measured across, the dome is still one of the biggest in the world, and its beauty remains unsurpassed.

THE MERRY DONATELLO AND HIS WONDERFUL FIGURES IN STONE

So far we have met Donatello only by name. He was the young friend who went with Brunelleschi to see Ghiberti's drawing for the gates. He was one of the merriest fellows, and perhaps it was because of the youth's sunny nature that Brunelleschi, who was ten years older, became his friend and companion. Donatello was the son of a wool merchant, who apprenticed him to a man who is supposed to have been Ghiberti's stepfather. At any rate, the boy learned, like Brunelleschi, the goldsmith's art, and, going to Rome with his friend, was able to support himself there by his skill in working in metals.

While Brunelleschi was studying the classic architecture of Rome, Donatello was studying the statuary. He had not his friend's capacity for great schemes and buildings, but he had just as fine a genius, and though he laughed and joked his way through life, he was destined to become Italy's greatest sculptor of later times, and the father of modern sculpture.

Before he went to Rome as a boy of fifteen he had carved a crucifix in wood, a statue of Mary Magdalene, and a marble statue of St. John, each of which may still be seen in Florence to-day. When he returned from the Eternal City, as Rome is called, he was twenty-one, and a finished sculptor.

DONATELLO'S STATUES FOR GIOTTO'S TOWER, & HIS FIGURE OF ST. GEORGE

Giotto's noble tower still needed some decoration, and Donatello was one of the sculptors engaged to complete it. He carved for it a lifelike figure called Zuccone, and as he gazed upon his finished work he took up his mallet, and, giving the statue a playful tap, said to it: "Speak!" Michael Angelo, who was not born until nine years after the death of Donatello, saw one of Donatello's famous statues. This one was the wonderful figure of St. George, clad in mail, looking as if it is ready to step down from its pedestal and do battle against wrong-doing and evil. And as Michael Angelo looked, he remembered what Donatello had said to Zuccone, and he himself now shouted: "March!" Could there be a finer compliment to a great sculptor's work?

All Donatello's statues are famous. They are beautiful in themselves, but they are important because of the effect they have had upon later sculpture. He had closely studied the glorious work of the ancients, and he reproduced their methods, stamped with his own genius. Until his day, men had been content to let the statues they carved be part of the buildings to which they belonged, as a cornice or a scroll is part of a building. Donatello made them actual portraits in stone, things of life and beauty, independent of their surroundings; figures whose merits command attention and admiration for themselves.

THE MODESTY OF DONATELLO, AND THE FAME OF THE DELLA ROBBIA FAMILY

From his thinking so highly of his work that he bade one of his statues "speak," it might be thought, perhaps, that Donatello was a vain man. But he was not. When people greatly praised him for his work in Padua, he said that he must return to Florence. "If I stay here, where I am praised by everybody," he said, "I shall soon forget all I know. At home in Florence everybody abuses me, and thus I am kept up to the mark, the constant blame forcing me constantly to study and, consequently, to do better work."

He had a joke and a kind word for everybody who deserved them, but once when a niggardly man complained that the sum charged by Donatello for a great head amounted to 25 cents a day for a month, he took his hammer and smashed his work to pieces.

It was not that he cared anything about money. All that he earned he used to put in a basket and hang up in his workshop, so that his friends and workmen could help themselves without troubling to ask him. He lived through a happy old age, and died when he was eighty.

A WINDOW IN GIOTTO'S TOWER

The lives of the men we have so far studied show us that the decoration of Florence was an unbroken series of works, spread over many years. The next man of genius to carry on the work was the great sculptor, Luca Della Robbia. He was born in Florence in 1400, and was one of Ghiberti's pupils. He took to art as naturally as Giotto had done, and showed such skill in working with marble and bronze that in 1437 he was ordered to complete the series of carvings in relief on one of the sides of Giotto's campanile.

The work was so beautifully done by Luca that it is hard to tell his work from that done by Giotto at his best. Donatello had done some famous carvings in the cathedral, and Luca was given the task of carving a similar set for another part of the cathedral. Donatello's were wonderful, but Luca's were even better. They were figures of singing angels and dancing boys, and were beautiful as the hand of man could make them. A copy of these may be seen in some museums.

This was not the only time that Luca Della Robbia and Donatello were rivals. The jolly Donatello was ordered to make a bronze door for one of the cathedral chapels, but he was too busy, or too happy, in doing other things, so the work was taken from him and given to Luca. The latter took twenty-one years over his task, but it was work fine enough to have occupied an artist a lifetime. The door is divided into ten panels, and the figures in it seem alive.

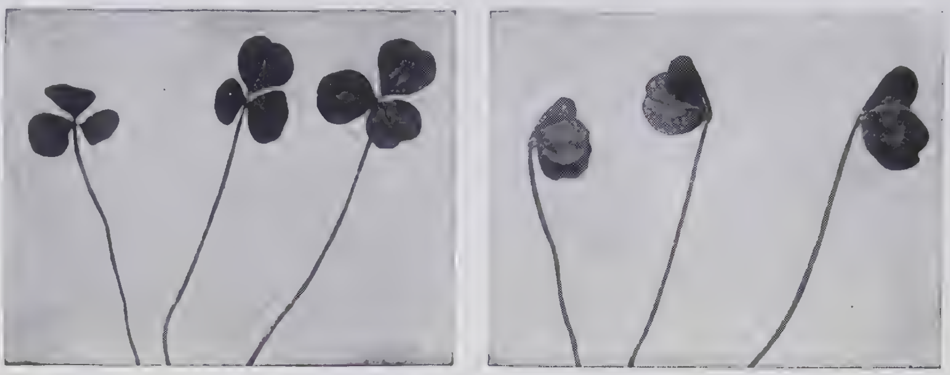
The statues done by Luca were excellent, and one, of the Bishop of Fiesole, is still famous. Much of his time was given to work in terra-cotta reliefs, that is, figures standing out from the flat surface from which they are modeled. These he tinted in soft, beautiful colors, and then covered them with a glaze and fired them. The glaze was already in use for majolica ware, but he improved the process of making it so much that it was called by his name.

There were other Della Robbias after Luca. He taught his nephew, Andrea Della Robbia, and Andrea taught five of his seven sons, of whom Giovanni was, after Luca and Andrea, the most famous of this talented family. Two of the seven sons became monks in order to follow Savonarola. These two sons of Andrea would thus be drawn into the company of Fra Bartolommeo, who, born in 1475, became one of the most renowned of Florentine artists working at the monastery of San Marco, where also worked Fra Angelico, another famous artist monk, of whom we read elsewhere.

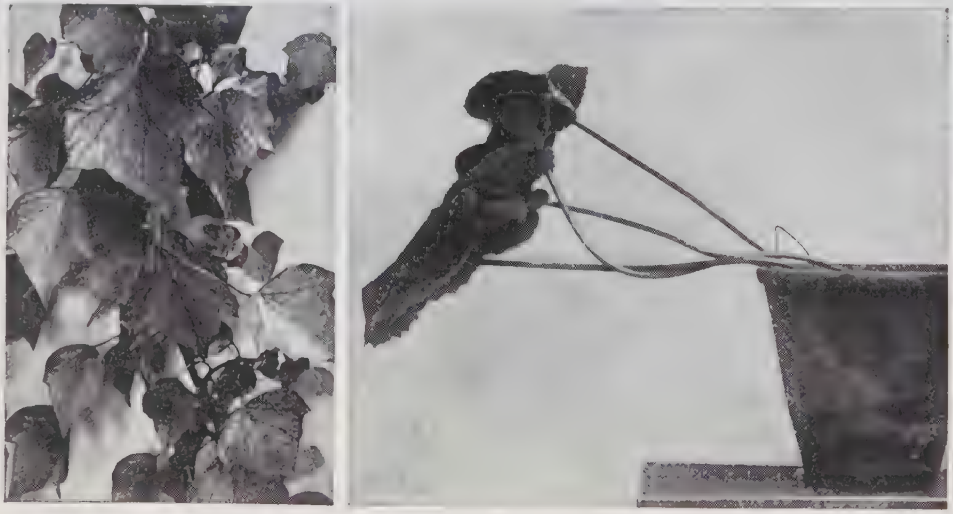
Afterwards there came to Florence the great Raphael, of whom we read on page 762. He was eight years younger than Bartolommeo, but he was able to teach Bartolommeo, and the monk was able to teach him. We read Michael Angelo's wonderful life in the story of the makers of Rome, but Florence was the city of his birth. He was born there in 1475, and carried out there some of his finest work.

THE NEXT MEN AND WOMEN BEGIN ON 2937

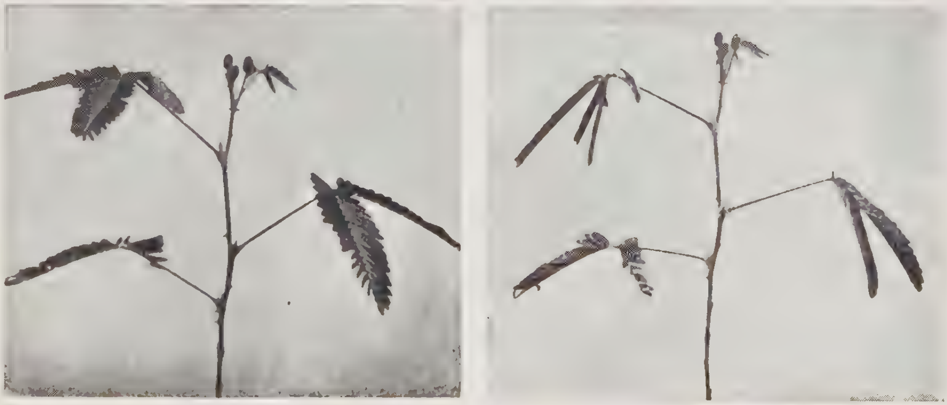
PLANTS THAT SEE AND PLANTS THAT FEEL



We read on page 1284 how the dark is a great help towards making us sleep, and the darker the room the more soundly we sleep. Plants, too, are very sensitive to light, as these two photographs show. The left-hand picture shows us clover by day, and that on the right shows us the same three leaves closed after sunset, so that they shall not feel the cold of the night. Many other plants go to sleep, by closing their leaves.



In order to grow up strong and healthy, all plants must have light. All leaves turn outwards towards the light, as the photograph on the left shows us. Some are so eager for light that they will move towards it like the plant on the right, which seems eager to stretch itself right out of the window near it.



Plants are not only affected by light, but also by touch. These pictures show us the Sensitive Plant, which is so called because the leaves close up at the slightest touch, as shown in the right-hand picture.

The photographs on this page are by Leonard Bastin, and that on page 2803 by Valentine.

WHAT THE WISE MAN TELLS US

"CAN the flowers see?" "Certainly not," we would answer emphatically; and yet the Wise Man tells us that they do see, many of them having little eyes that are especially sensitive to light and take impressions somewhat like the lenses of a camera. Light, the Wise Man says, is not a thing, but a state of motion or vibration in the ether, or a kind of electricity. "But ether, what is ether?" and the Wise Man answers that question too, for there seems to be nothing that he does not know. He tells us here why it is that we see stars when we are hit in the eyes; why red will irritate a bull to uncontrollable fury; how the forests that turned into coal came to be buried so deep in the earth that the poor miners have to live half their lives in the dark in order to get the fuel that gives us light,—these and many other things he tells us,—but we must read with attention if we wish to remember.

CAN THE FLOWERS SEE?

CONTINUED FROM 2736

WE know now that, though no one would say that plants perceive the images of things as we do with our eyes, yet they certainly can see. Nearly all the leaves of plants are so made that they act as lenses, and it is possible to take photographs by using leaves for the lenses of the camera. The leaves that are best in this respect seem to be those grown in shady places, where light is especially precious. These leaf-lenses have two useful purposes. They seem, in the first place, to concentrate and focus the light that reaches the leaf exactly upon the cells in the leaf which, by the aid of light, feed on the carbon dioxide of the air. It seems, in the second place, that the plant's power of seeing, or of knowing the difference between light and darkness, often guides it so that it can turn its leaves at just the angle which will enable them to receive most light. Besides this general power of leaves, it seems that many green plants, if not all, have special points, which have been called *ocelli*, or *little eyes*, that are especially sensitive to light, and are developed for that purpose

WHAT IS LIGHT MADE OF?

Light is a very real and powerful and precious thing—yet it is not a *thing*, as a chair is a thing; and it is quite correct to say that, in a sense, light is made of nothing. It is not a form of matter, it is not made of any elements or any compounds, there are no atoms in it; and it does not attract matter, nor is it attracted by matter. Light was once thought to be made of something—and by the very greatest man who ever studied it. Sir Isaac Newton thought that light must be made of a number of tiny specks of stuff that struck the eye, or bounced off any bright object, as a ball bounces from a wall. But now we know that light is not a *thing* or a number of things at all, but is a *state* of motion, or strain, or vibration, in the ether. If we may say that light is made of anything, then we must say that it is made of the ether—but the ether in a particular state of what we call wave-motion. If light were *material*—if it were made of matter—it would have to obey the law of gravitation, but we can prove that it does not.

IS LIGHT A KIND OF ELECTRICITY?

We know quite certainly now that light is a kind of electricity—or that electricity is a kind of light; on page 1450 of this book it is explained that the word electricity is most unfortunately used to mean two quite different things. Here we mean electric waves, like those which pass along a wire in telegraphing or telephoning, or through the air in wireless telegraphy. In all these cases what really travels is a wave in the ether, and light is a wave of the same kind, traveling at the same rate exactly, and subject to the same laws in every way. Only the waves of light are shorter and the number of them that occur in a second is much larger than in the case of the ether. The difference is the same as that between a low note and a high note of sound.

Light, then, is a kind of electricity. The waves of light, of radiant heat, and of electricity, differ from the waves of sound: first, because they travel in the ether, and not in anything material; and, secondly, because they are waves from side to side, and not to and fro in the line of their flight through space.

WHAT IS THE ETHER?

Ether is the chemical name of a sweet-smelling liquid, made of carbon, hydrogen, and oxygen, which, like chloroform, produces a peculiar kind of sleep for surgical operations. But when we speak of *the* ether we mean something utterly different. Of course, we should have two different words for the two things, but we have not. If we understood the ether, we should have the key to almost every puzzle we find in Nature. At present we know very little about it, but we are sure of certain facts. The ether is *everywhere.* We cannot believe that there is any gap or space or crack in it. It cannot be seen, yet we may say that we see nothing else, for light is a state of the ether, and light is the only thing we can see.

The ether has no weight, yet it is the cause of weight, in a sense, for weight is due to gravitation, and it is through the ether that gravitation acts. And we believe that matter is really made of the ether—that "the electric" particles, or electrons, of which the atoms of matter are composed, themselves consist of things in the ether which we can only dimly picture to ourselves as knots or lumps of ether.

Yet, though we do not know how, there is now really no doubt that the ether is the universal mother of all matter, and of all material things; it is the element of elements, and we cannot pierce behind it to anything, but to the Author of all that is.

WHAT MAKES US SEE LIGHTS WHEN WE GET A BLOW ON THE EYE?

This depends on a very wonderful law about the nerves of the senses, that was discovered by a great German called Müller about the middle of last century. It is that special nerves which belong to the various senses, the nerves of hearing, the nerves of smell, the nerves of vision, and so on, are bound to give us a sensation of hearing or smell or vision if they give us anything. As a rule, the particular nerve is only affected by the special thing it is meant for—the eye-nerve by light or the ear-nerve by sound. But if something has the power at all of affecting the nerve, then we shall seem to see or hear, whatever the thing that excites the nerves really is. Thus a blow on the eye may affect the eye-nerve, and if the eye-nerve is affected we are bound to get a sensation of light. The best proof of this great law of Müller is furnished by electricity. We have no special sense for electricity, as we have the ear for sound or the eye for light; but, if properly applied, electricity is capable of affecting, or stimulating, which is the proper word, any nerve in the body. So, with the electric current you may affect the nose, and the person smells; the eye, and he sees; the ear, and he hears; the tongue, and he tastes; the skin, and he has the sense of touch. We now know how to explain this law. It is not that the nerve of the eye is different from the nerve of the ear, but that it goes to a special part of the brain. Each part of the brain that is concerned in the sensation *is specialized*, or made special—that is, it can only do one thing. The different parts are like the notes of a piano, each of which gives out only the sound natural to it, and no other.

HOW DID THE FORESTS THAT TURNED TO COAL COME TO BE BURIED?

The earth that covers the great coal deposits of the earth's crust was laid there through long ages by the sea. Nothing is more certain than that the sea rolled for many ages over every part of what we call the dry land. Probably most parts of the earth's surface have many times been under water and many times above it. The land where coal now is sank and was covered by the sea. Wherever the sea is, there its water slowly deposits an ever-deepening layer of substances which it has dissolved from the rocks, and other materials which rivers have brought, and yet others which are the remains of creatures living in its depths.

Then, as the waters roll elsewhere, and the bottom of the sea is uncovered, the surface of these deposits becomes the surface of the dry land. If we study the rate at which the waters are forming deposits to-day, we can get some idea of the time that has passed since various layers of the earth's crust were on the surface, as every layer of it has at some time been; and so we can see that many millions of years have elapsed since the coal measures were alive.

ARE WE CREATING NEW DISEASES?

I believe that the answer to this most important question is "No." It is not easy to answer, because we know really very little about the diseases our ancestors died of; but the more we learn by reading the old authors, by studying skeletons and mummies, and so on, the more certain are we that our ancestors suffered from our diseases, and even from other diseases that we have not.

Our cities, with their terrible overcrowding, may mean that diseases spread very easily, but these diseases are not new ones. Dirt makes disease, but our ancestors were ever so much dirtier than we are. They had no such supplies of pure water as our towns have; they drank very impure water, they had no drainage, and they lived in perpetual smells. We find proof that the diseases which are most deadly to-day, like tuberculosis, were well known and terribly common 2,000 and even 5,000 years ago. If we create any new diseases, they can only be diseases of the mind, due to the foolish and unnatural lives that many of us live; but doubtless, when any of our ancestors lived these foolish lives, they suffered as we do.

DO DISEASES EVER DISAPPEAR?

Yes, indeed they do, and it is a good thing, too. There was a time when England was cursed with a very terrible disease which has its real home in China, and is called the plague. There is now no plague in England, though it would soon come back if a careful watch were not kept for it at every port, and if every case that reaches London or Liverpool or Glasgow were not at once kept apart, so that the plague does not spread. There was once leprosy in England, and the poor lepers were imprisoned in great places. There is now no leprosy in England, and has not been for many years, except a few persons who have got it abroad, and returned to live in England. Smallpox, too, has almost disappeared in England, it is little known in this country, and in Germany it is practically unknown, for in Germany the discovery of vaccination by the Englishman Jenner is appreciated by the nation and is employed generally.

Yellow fever and malaria have disappeared from places where they had raged for ages, because the insects that carried them have all been killed. Not very long ago a terrible disease, called Malta fever, was made almost to disappear from Malta, as it was learned that it is carried in goat's milk. No soldier or sailor in Malta is allowed to drink goat's milk, and so they do not suffer from the disease.

ARE WE HEALTHIER THAN OUR ANCESTORS?

Certainly we are—far healthier. The death-rate has been falling all over the United States for many years. We know at what ages our ancestors commonly died—even those who had most wealth and knowledge. We know that, long ago, the children of the kings and queens died at much the same rate as the children of the slums do nowadays. We know hideous diseases which raged in America and are now unknown, or very rare. Only a generation ago, for instance, typhus was very common, and now it hardly causes ten deaths in the whole of America in a year, though the disease is still sadly common in some very poor countries.

Nothing is more foolish or stupid than to talk of the "good old days," as if everyone had been happy, and wise, and strong, long ago. The more we learn of the "good old days," the more we learn how bad they were, and how much better off we are now; though our children's children will think we were bad enough, when they have abolished tuberculosis and other terrible diseases which we could abolish at any time if only we were wise enough.

WHAT CAUSES TUBERCULOSIS?

Tuberculosis is caused by a microbe, which was discovered in Germany near the end of the last century. We catch it from each other, and from the milk—and occasionally the flesh—of cows, which suffer from it just as we do if they are kept in badly ventilated places. The disease is now diminishing in America, England, France, and Germany, and will go on diminishing the more we act on our knowledge of its cause. They do this best in Germany, and it is decreasing much more rapidly there than it is here. We have begun here to protect ourselves from the milk of tubercular cows, to punish people for spitting in trains and street cars, and to learn to keep our bedroom windows open, and when you who are children, and who read this now, have grown up to be men and women, tuberculosis will probably be as rare as typhus is to-day.

The children of to-day will be the grown-up people who govern America and vote for members of Congress in a few years to come; and the next generation will learn that the health of the people is the best possession of a nation, and will know how to obtain it. The children of to-day, and even more their children, will look back on us, who allowed ourselves to be killed by tuberculosis at the rate of about one in seven of all deaths—and they will not talk of the "good old days."

WHY DOES RED IRRITATE A BULL?

It is very difficult to be quite sure of the truth of this question, and we ought really to be sure of the fact before we try to explain it. No one has made experiments to prove that red really irritates the bull more than any other bright color. Still, it is probable that red, perhaps just because it is usually the brightest of colors, does irritate a bull; though if the red color were on something that did not move, perhaps it would have much less effect. People have thought that bulls are irritated by red because it is the color of blood; but I do not think that is so. A certain amount of study of human beings seems to suggest that different colors differ in their effect on the nervous system, and that while such colors as green and violet are soothing, yellow and red are exciting. Of course, it takes very little to irritate a bull, and a red rag is by no means necessary; only the saying is so popular, perhaps because it applies so well to ourselves. We are all apt to fire up at some particular subject, as the bull is supposed to do at a red rag.

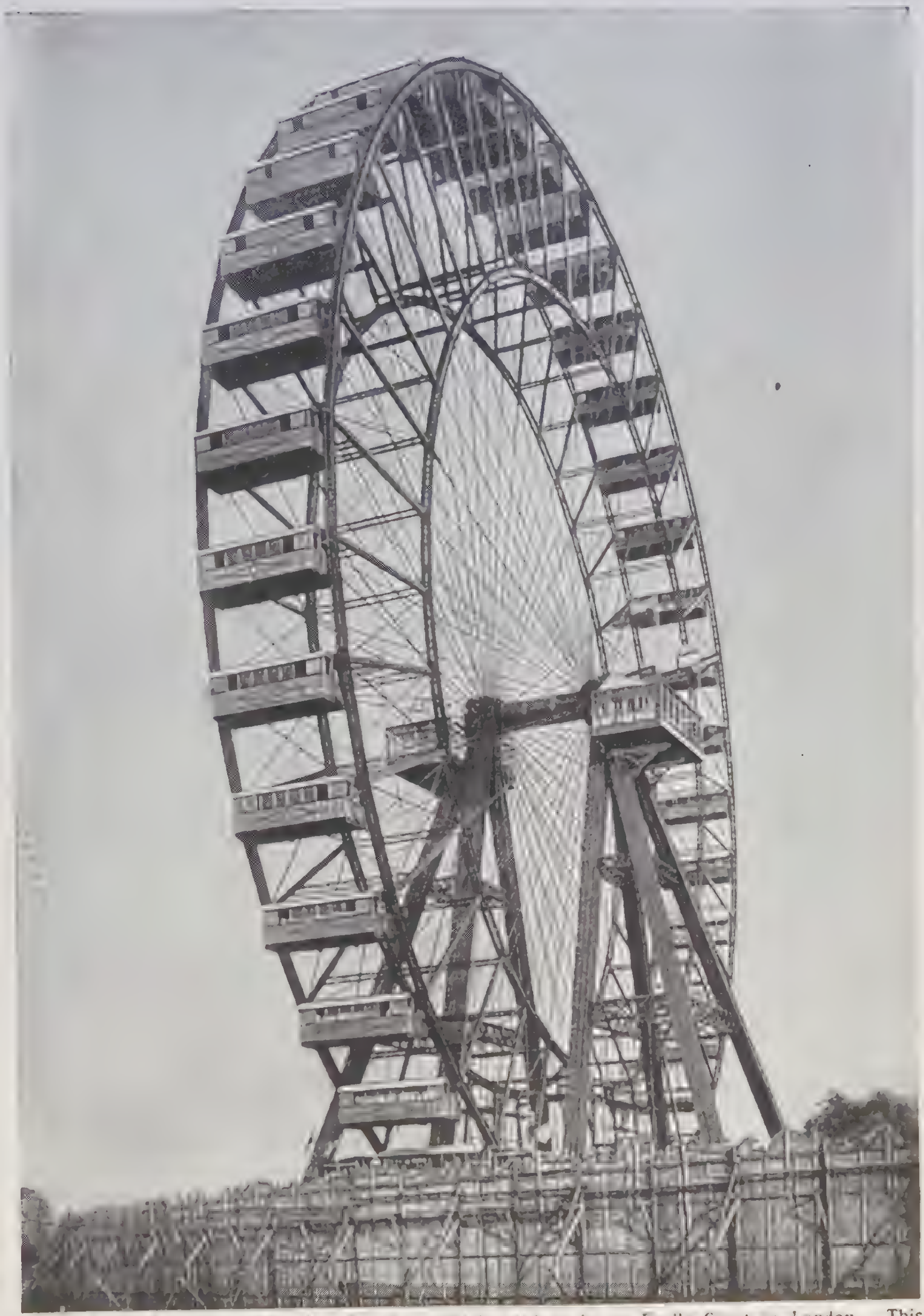
DOES THIS EARTH LOOK LIKE A STAR TO OTHER PLANETS?

Our earth must be a very brilliant object in the sky. Seen from the distance of the moon, it would be magnificent, though, like the moon, shining entirely by borrowed light. To an inhabitant of Mars, if he exists, the earth will probably look much brighter and larger than Mars looks to us, since the earth is much larger than Mars, and much nearer the sun, so that it is proportionately brighter, according to the "law of inverse squares," explained on page 2536. But there is a very striking fact about the earth, as it must appear to all the planets, from Mars outwards, that are farther than we are from the sun. As the earth lies between them and the sun, the portion of the earth's surface that they can see illuminated must change, and be always changing; for exactly the same reason as we notice in the case of the moon. When the earth is just between Mars and the sun, she must be invisible from Mars, because the shining side of her is turned away from Mars. This must also be true of the appearance of the earth as seen from any planet still farther than Mars. To the other planets the earth will be recognized as a planet, and not a star—if they have inhabitants who possess intelligence—because she will be seen to wander through the sky, as the other planets, or wanderers, are seen to do from the earth.

WHY IS VENUS BRIGHTER AT SOME TIMES THAN AT OTHERS?

The principal answer to this question can be guessed by anyone who has read the answer to the last question. Venus is nearer to the sun than we are, and therefore Venus must have phases like the moon—times when she is full, times when she appears as a crescent, and so on. That this is so was one of the many wonderful discoveries made by Galileo, when he perfected his telescope. I wonder what lovers of Nature would give

A WHEEL A QUARTER OF A MILE ROUND



Some of you have seen this gigantic wheel which used to be at Earl's Court in London. This was not the first great wheel to be built. An American engineer, Mr G. W. Ferris, had seen those curious little upright roundabouts that come to the country fairs, and he thought out the idea and built for the World's Fair at Chicago a big wheel of iron that carried 1,440 people at one time. Then the Earl's Court wheel was built, and this was much more wonderful than the other. It was 300 feet across, and the towers that supported it were 175 feet high. The axle, weighing 54 tons, was hollow, and people could walk through it from one side to the other while the wheel was going round with its 1,600 passengers. The great wheel was turned by a big engine that needed only one man to work it.

nowadays for a new instrument of such power as the telescope has, and the first chance of using it! Galileo had scarcely to do more than put his "spyglass" to his eye, in order to discover the spots on the sun, the craters of the moon, four of the moons of Jupiter, the phases of Venus, and the rings of Saturn! He did not dare to announce his discovery about Venus in an open way; but, of course, he wished to place the fact on record, so he wrote an acrostic, in which was hidden the statement that Venus has phases like the moon. It needs only a quite small glass, such as Galileo's was, to see the disk of Venus, and so to find that it changes just as the moon does—though, naturally, at a very different rate. I am writing in September, and just now the illuminated portion of Venus is between four-tenths and five-tenths of its disk, so it is nearly "half-Venus."

Of course, all the other planets, except Mercury, are always seen by us on their lit side, as they are farther away from the sun than we are. Mercury is so small and difficult to see, owing to its nearness to the sun, that it would be very difficult indeed to make out its phases.

WHAT IS THE DIFFERENCE BETWEEN FAT AND OIL?

Oil is a misleading word, for it is used in two senses. We call the things that give plants their smell, such as turpentine, oils, but they are quite different from other oils, and we should always call them *volatile oils*, which means flying oils, because they readily fly into the air in the form of a gas. If you put a drop of such an oil on a piece of paper, it soon disappears; but if you put a drop of any of the other kind of oils, such as melted butter, on a piece of paper, it makes a mark which stays. So these oils are called *fixed oils*, and the simple thing to remember is that fixed oils and fats are really the same thing. When it is solid we call it fat; when liquid, we call it oil. A fixed oil is melted fat, and fat is a fixed oil that has turned solid. Every fat has a melting-point, as we call it, when it is so warm that it melts and turns into oil; or we might say that every fixed oil has a freezing-point, when it is so cool that it solidifies and turns into fat.

Now, it is a very interesting thing about the fat of our bodies that its melting-point is just the temperature of the blood. So the fat of our bodies is always just at a point where it is neither quite solid nor quite liquid; and this is just the state of it that suits us best. If it were quite solid, then the blood could not easily help itself to it as it was needed; and if it were quite liquid, it would not stay in one place. There are hundreds of different fats and oils and mixtures of them, and they all have their own particular melting-point, above which they are liquid oils, and below which they are solid fats.

WHAT DO WE MEAN BY TRADITION?

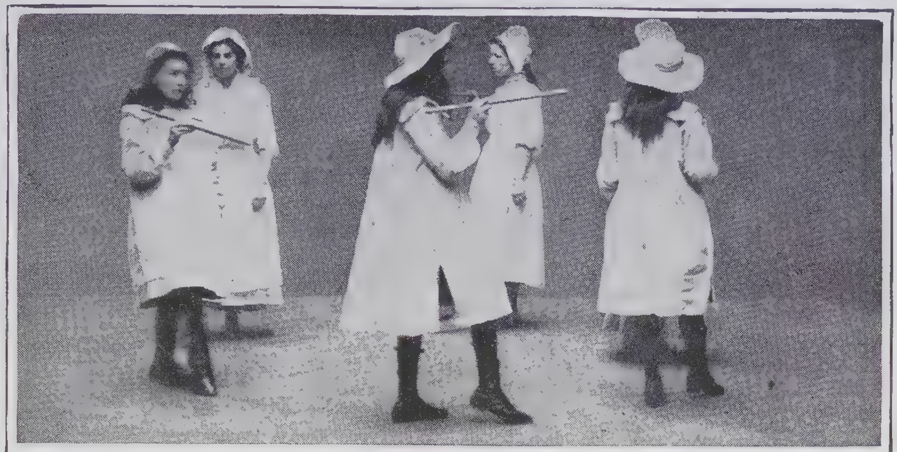
When knowledge of any kind is handed down from father to son, we say that it is tradition, which really means *giving across*. Tradition may be given across by word of mouth, or, in later stages of civilization, by books.

It is one of the most unfortunate things in the history of the world that tradition so very often gets lost, as in the case of the Pyramids, for instance. Probably tradition is quite safe so long as a particular civilization persists, but it is always seriously endangered when one nation is conquered by another. For one thing, books and inscribed stones and walls are destroyed by the soldiers when cities are captured, and so all the traditional knowledge which they contain is lost to the world.

HOW IS IT THAT KNOWLEDGE CAN EVER DIE OUT?

As for tradition from parents to children, when a nation is conquered, many parents are killed, and children are carried off to other places, or, at any rate, are separated from their parents. In olden times almost every grown man of a conquered nation was either killed or enslaved, and so lost his children, and his traditional knowledge died with him. This may have happened in the case of the Pyramids, and it is quite possible that full accounts of how they were built were contained in the great library of Alexandria, and were lost when that library was burned. The really wonderful thing about our knowledge of olden times is how learned men manage to find out about the remote past by digging up and interpreting bits of inscriptions on stone in languages to which, at first, no one can find the key.

THE NEXT QUESTIONS BEGIN ON PAGE 2907.



The six Morris dancers in costume performing the "Ring" figure in the Bean Setting Dance

HOW TO DANCE THE MORRIS DANCES

CONTINUED FROM 2726

THE quaint old English Morris Dances, though of Moorish origin and taken into England in the Middle Ages, perhaps from Spain by John of Gaunt, became very popular in that country. The country folk altered them to suit their own ideas of a dance for holidays and feast days, so that from the time of Queen Elizabeth no festival was complete without the merrie Morris men. Just when the dances were in danger of being forgotten, new interest in them arose, and now they are much practised in gymnastic and dancing classes. The old tunes which go with them have also been preserved and adapted to the modern piano. They are in various times, and the step also changes in height and length.

And first, how do the dancers dress, and what do they need? The old Morris men wore very fantastic garments, but girls and boys who dance now can hardly do better than wear the simple rustic ones shown in the pictures—the boys, or girls taking the boys' parts, holland smocks and hats; the girls, cotton frocks and sun-bonnets. All of them wear elastic bands round the leg, on to which four or more bells are sewn. These can be bought at 10 cents a dozen. Ribbons may be worn, but the bells are essential to all the dances, and one object of taking the jump is to rattle the bells.

Then sticks will be wanted for some of the dances, plain round wooden sticks about eighteen inches in length. They can be bought in bundles, or made at home from curtain-rollers or sticks for tying up flowers. Each dancer will want two handkerchiefs.

The Morris Dances have a special step and a peculiar jump; one or the other, the step or the jump, is going on throughout the dance. The jump is taken with the body held straight and then raised by springing suddenly with both feet off the ground. The feet land on the ball of the foot, the toes touching before the heels, so that the spine is not jarred. The step is easily imitated when once seen, and the music almost suggests it. In Bean Setting you raise the right foot as you do in taking a walking step, and move it forward so that the heel is about as advanced as a foot length from the toes of the left foot. Then hop twice on the left foot, and repeat the step with the right foot.

One form of the step used in the Laudnum Bunches bears a likeness to the polka step, only danced with stiff knees, hopping on right, on left, on right, and on right again, with left extended in front.

In the high step which belongs to the Capers movement described later on, the toes of the lifted foot are as high as the knee of the other leg. The step matches the music so well that it is difficult not to keep time.

The names of the Morris Dances are as quaint as themselves, and suggest their country origin. The best known are probably Bean Setting, Laudnum Bunches, Rigs o' Marlow, The Old Woman Tossed Up in a Blanket, Constant Billy, Shepherd's Hay or Hey, Bluff King Hal, Trunkles, Blue-Eyed Stranger, Country Gardens, The Cuckoo's Nest, and Princess Royal.

Thoroughly characteristic are the first two of these, which are here described in detail. In these dances six dancers form a set, and start in two files with faces towards the music, No. 1 dancer nearest to it, like this:

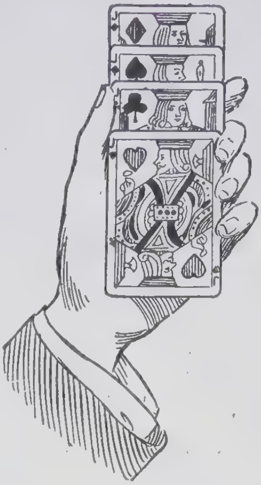
Dancer No. 5 partner with dancer No. 6.
Dancer No. 3 partner with dancer No. 4.
Dancer No. 1 partner with dancer No. 2.

SEE PAGES 3322 AND 3323.

THE ROBBERS AND THE SOLDIERS

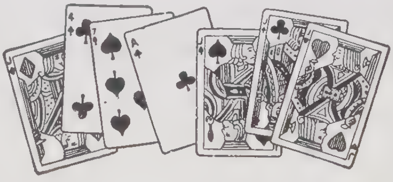
THIS card trick is very simple, but rather mystifying. It requires no expert ability to perform, hence it is one that is very suitable for young conjurers.

The conjurer has a pack of cards, and he takes out the four knaves, which he holds up to the company in the manner shown in picture 1. Then he tells the company his story. "Once upon a time," he says, "there were four robbers in Spain, and their robberies had caused them to be pursued by a band of Spanish soldiers. These four knaves are the four robbers. As they fled they came to a ruined castle, and the pack of cards here is the castle. The robbers entered the castle"—here the conjurer lays the cards in his hands, face downwards, upon the rest of the pack—"and held a council. They decided that one of their number should keep watch."


1. The four robbers.

At this point he lifts the top card and throws it, face upwards, upon the table, then resuming: "That is the robber who kept watch, and the other three went down to the dungeon to sleep."

Here he takes the three cards on the top of the pack one by one, and, without allowing their faces to be seen, he puts them at the bottom of the pack. He keeps up his story as he does so: "These are the three robbers who went down to sleep, and it was agreed that, if the watching robber saw the soldiers approach, he should at once call the others. Shortly after midnight, the robber who was keeping watch saw, where the moonlight shone through the trees, that a company of soldiers was approaching. He immediately called to the others: '*Come up, come up, come up!*'"—here the conjurer flips the edges of the pack with one hand—"and immediately the robbers all sprang to their feet."


2. The cards as they would look if spread out.

At this point he takes the three top cards in the pack and throws them, face upwards, on the table. They are the other three knaves, which the members of the audience are positive that they saw placed at the bottom of the pack. How did they get to the top? That is what the audience cannot understand, and what you want to know in order to be able to perform the trick.

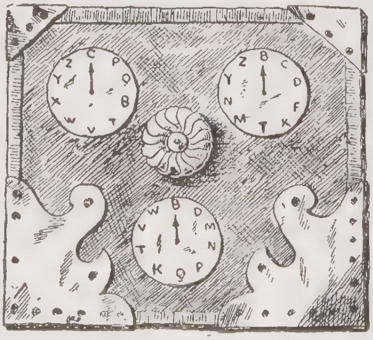
The explanation is very simple. The three knaves were not put at the bottom of the pack at all, although they seemed to be. The conjurer had seven cards in his hand, not four. Between the first knave and the second knave were three other cards—any three—from the pack, but they were placed so that they could not be seen by the spectators.

If the conjurer had spread out the cards, which, of course, he would not do, as it would have exposed the trick, they would have been like picture 2. Thus the three cards that were put at the bottom of the pack were the three hidden cards, not the knaves at all, and the knaves remained at the top of the pack, ready to be exposed as soon as the watching robber called: "Come up, come up, come up!"

This is a good trick, but it should not be performed too often in front of the same audience or it is very apt to be found out.

THE PUZZLE OF THE SECRET LOCK

ONCE upon a time there lived a very rich man who possessed a great number of very valuable vessels, made of silver and gold. From time to time, however, thieves succeeded in entering his mansion and carrying off some of these precious vessels. He therefore decided that he must have them locked up more carefully than before. Accordingly he gave instructions for a very strong safe to be made, and arranged that it should have a secret lock. On the outside of the lock were placed three dials, each with a pointer and ten letters on it. Before anyone could turn the handle which opened the door of the safe, he had to turn round each pointer to a certain letter, a different one on each dial. We see what the lock looked like and what letters were placed on each face in the picture, which is reproduced from Mr. Dudeney's "Canterbury Puzzles." Now, any thief who was endeavoring to turn the handle of the safe would, unless he were very fortunate indeed, take a very long time before he attained this object, because he might have to go through 999 combinations of letters before finding the right three. The rich man told the three letters to his two most trusted servants, and, in order that they might remember them the more easily, the three letters which he had selected formed a word. How many of us are able to discover what the word was?


C P Q B T V W X Y Z
B C D F K T M N Y Z
B D M N P Q K T V W

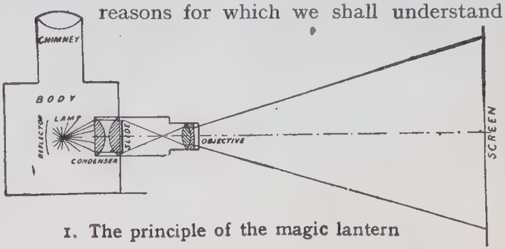
HOW TO MAKE A MAGIC LANTERN

IT is well to mention at once that scientific people do not use the term magic lantern now, but prefer the term *optical* lantern. The prefix *magic* arose in an age when scientific men were regarded as magicians, or dealers in the black art, because their researches and methods were not understood by ordinary people. There is no magic or mystery in the lantern, but it is simply an instrument of scientific value, as well as amusement, in which the laws of optics are utilized to enlarge greatly the image of an object on the slide, and to make it appear on a screen.

There is much difference between the construction of a high-class instrument of science and the little lantern which is described here, but the principle is identical in both. The elements of any lantern are, as indicated in picture 1, the *body* or casing; the *condenser*, which receives light from the *lamp*, or other source of illumination, and transmits it through the *slide*; and finally the *objective* or magnifying glass, which focuses the light received from the condenser through the slide, and transmits it to the *screen*.

A single lantern can be made in several different ways, as well as in different sizes. A very elementary form of magic lantern might be made from an old tin cracker-box, with a cheap wall-back lamp and a simple lens, and a slide-carrier made from the wood of a cigar-box. But we are going to make something much more like a perfected scientific instrument, even if it entail the expenditure of a dollar or more. We shall adopt the old-fashioned oil-lamp to furnish the necessary light. It is not so bright as oxy-hydrogen lime-light, acetylene, or electricity, and it is very hot, but good results are obtained with a suitable lamp, well tended, and nearly all the smaller simple lanterns are illuminated in this way.

In settling the size of the lantern, the cost of fittings must be considered, because what are termed the *optical parts* must be purchased, as you cannot make your own condenser and objective, nor can you make very easily the tubes in which they are mounted.

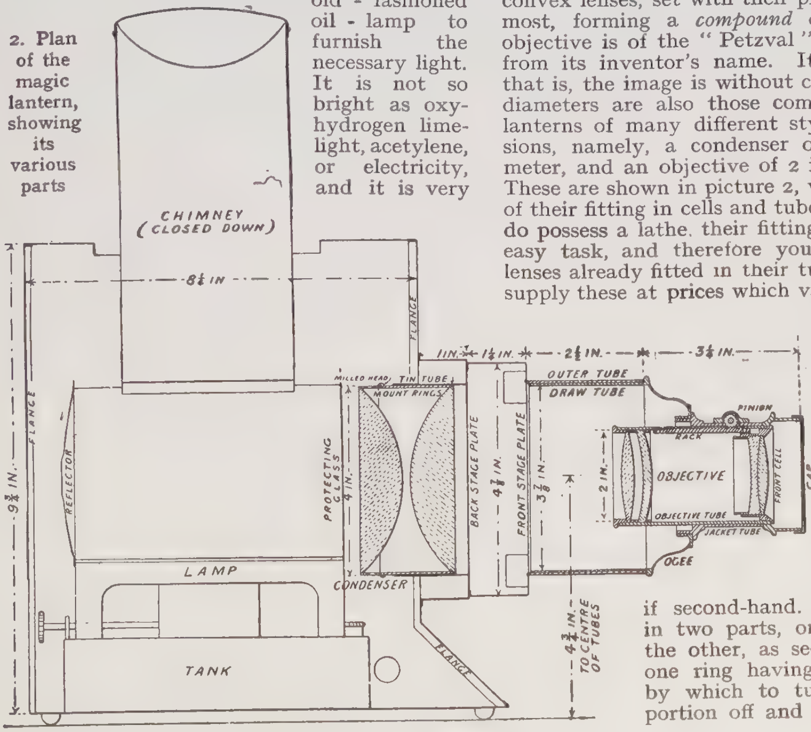


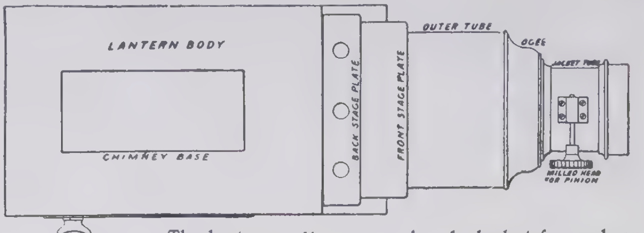
1. The principle of the magic lantern

The most important part of the lantern is the optical. On this depends the clearness of the picture thrown on the screen. Many of the cheapest lanterns have simple lenses, but they do not give bright, clear definitions free from color rings. To ensure good results, lenses must be combined in certain fashions, the reasons for which we shall understand some day when we study the laws which govern the refraction of light. There are many such combinations. Those which we select for this lantern are shown in picture 2, and are the ones which are most generally used. The condenser is composed of two plano-convex lenses, set with their plane faces outermost, forming a *compound* condenser. The objective is of the "Petzval" form, so called from its inventor's name. It is achromatic, that is, the image is without color rings. The diameters are also those commonly used for lanterns of many different styles and dimensions, namely, a condenser of 4 inches diameter, and an objective of 2 inches diameter. These are shown in picture 2, with the method of their fitting in cells and tubes. Even if you do possess a lathe, their fitting is not at all an easy task, and therefore you must buy the lenses already fitted in their tubes. Opticians supply these at prices which vary according to quality. Their names and fittings are as follows:

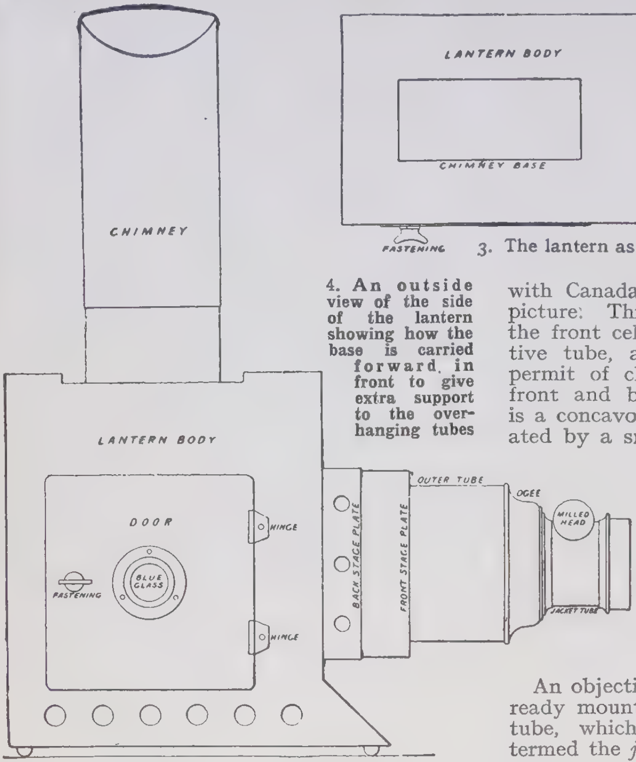
A 4-inch condenser, of compound plano-convex type, may be purchased ready in its *mount* or *cell* for 2 dollars new, and less if second-hand. The mount is in two parts, one screwed over the other, as seen in picture 2, one ring having a milled head by which to turn the screwed portion off and on. A few air-

2. Plan of the magic lantern, showing its various parts





3. The lantern as it appears when looked at from above



4. An outside view of the side of the lantern showing how the base is carried forward in front to give extra support to the overhanging tubes

holes are made, to prevent mist from forming. The back lens is liable to become cracked by the heat of the lamp. For this reason the lenses are fitted loosely in their mounts, so that they will rattle, and the hinder one is often protected with a disk of plain glass, as shown in the picture.

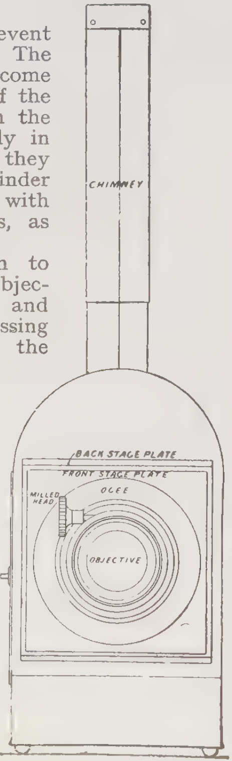
In essential relation to the condenser is the objective, which receives and transmits the light passing through the image to the screen. This is shown in picture 2, and comprizes two distinct sets of lenses in a tube, which is slid by means of a rack and pinion in an outer or jacket tube—as also shown in picture 3—which has a connection to the condenser tube. The front combination comprizes a double convex lens of crown glass—the front one in the picture—and a nearly plano-concave—actually a double-concave—lens of flint glass cemented to it with Canada balsam, the hinder one in the picture. This is mounted in a little cell—the front cell—distinct from the main objective tube, and screwed into the latter, to permit of cleaning the inner faces of both front and back lenses. At the back there is a concavo-convex lens of flint glass, separated by a small space from a double-convex lens of crown glass. These are both secured in the rear end of the objective tube as shown.

The front of the objective is often fitted with a hinged cover termed a *flasher*, which shuts off the image from the screen. In this one a cap is fitted to the front tube, like that used on some cameras.

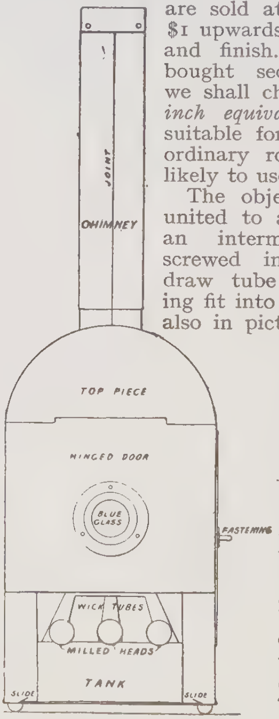
An objective of this kind can be purchased ready mounted in a polished brass objective tube, which slides in another brass tube termed the *jacket*, with a rack and pinion for effecting the adjustment. This is essential for exact focusing. Such mounted objectives are sold at prices ranging from $1 upwards, according to quality and finish. They can also be bought second-hand. The one we shall choose should be of 6-*inch equivalent focus*, which is suitable for lantern work in an ordinary room such as we are likely to use.

The objective combination is united to a *draw tube*, through an intermediate *ogee*, being screwed into the latter. The draw tube is inserted, a sliding fit into an *outer tube*, as seen also in picture 3, which permits the lenses to be readily taken out of the lantern when not in use. The outer tube is fitted with an internal flange, and soldered to the *front stage plate* or slide-carrier plate.

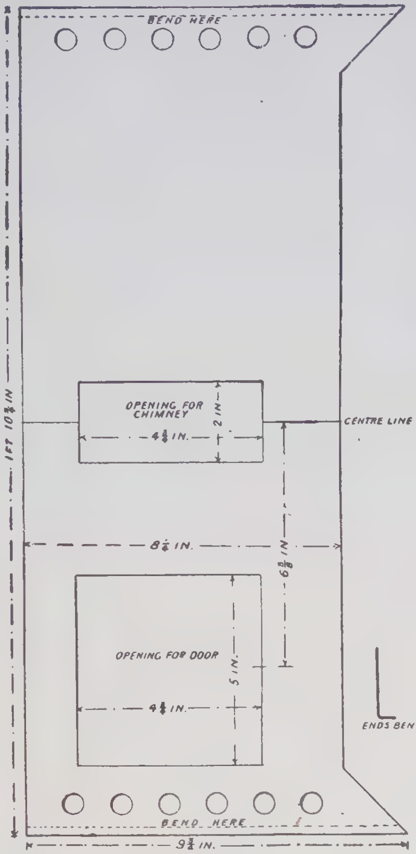
Between the condenser and the objective the picture slides have to be placed, and sundry plates have to be fitted to effect these connections. Behind the condenser is the lamp. These connections and details will be better



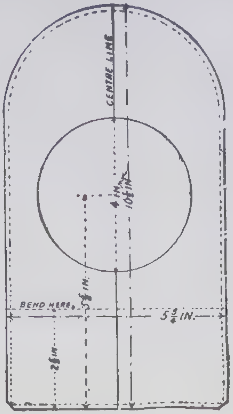
5. Front view of lantern



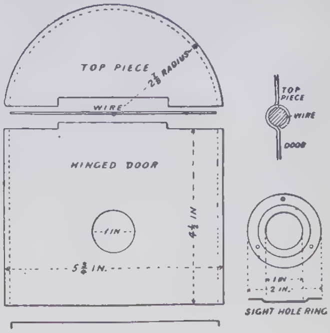
6. Back view of lantern



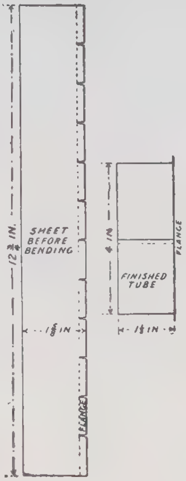
7. Sheet prepared for bending



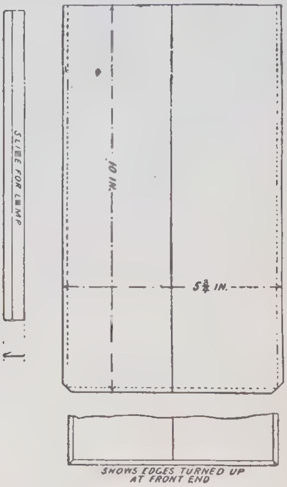
8. Front sheet



9. The parts for back of lantern



11. Tube for condenser

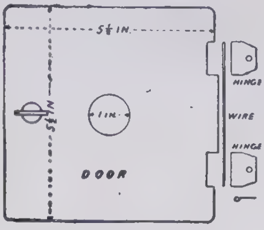


10. Bottom of lantern

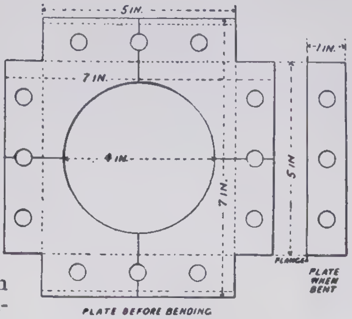
studied after the body of the lantern has been made, which work we shall now take up. In the view given in picture 2, the lantern is supposed to have been cut down vertically through the centre. In picture 3 we are looking down on the outside of the lantern from above. In picture 4 we see the lantern from the side, in picture 5 from the front, and in picture 6 from the back. The base is carried forward at the front, as shown in pictures 2 and 4, to give extra support to the overhanging tubes.

The best lantern bodies are made of mahogany, lined with sheet iron, leaving an air-space of a quarter of an inch or so between the iron and the wood. We must make something simpler, as shown in the pictures. The body may be built either of sheet iron or of tin. Russian sheet iron is better than the ordinary quality. If tin is used it must be japanned black, but this can be done after it is made into shape. The tin can be cut with a strong pair of scissors, but if you can borrow a pair of shears from a friendly tin-smith the work will be rather easier. It is worked very readily, and you should meet with little difficulty in this part of the task. The lantern body, too, is designed as simply as possible, comprizing only four distinct pieces of tin in the main portion. The sides and top are in one sheet, shown in picture 7; the ends are in two pieces, shown in pictures 8 and 9; and the bottom is in one piece, shown in picture 10.

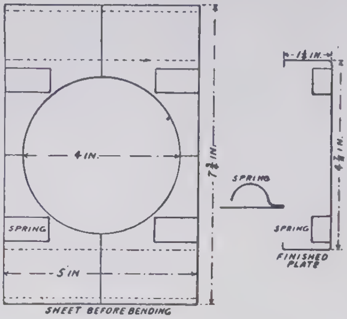
The sheet for the sides and top is made in one, to avoid jointing the top. It is cut to the dimensions given in picture 7, including an opening for the chimney, an opening for the door at the side, and six half-inch round holes are cut at both ends to afford draught for the lamp. When marking this out, start from the *centre line*, cutting each half on each side of this line exactly alike, with the exception of the door-opening. As you will not cut the edges exactly correct with scissors or shears, a file will have to be used to produce accurate results. Also, the back edge must be finished smoothly, as you might not be able to manage a beaded edge well, which is done in shop lanterns. The sheet must be bent to a semicircle at the centre, as shown in pictures 5 and 6. The easiest way to do this is to plane a block of wood to the curve, and bend the sheet round that until it fits the curve exactly. Or you might find a piece of pipe of about the right curve. The extreme ends must be hammered and bent sharply over the edge of a block



12. The side door



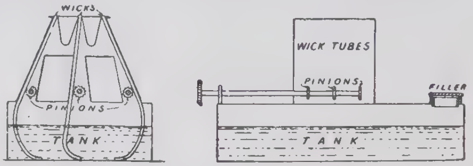
13. The back stage plate



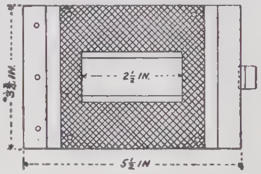
14. The front stage plate

of iron or wood, as seen in pictures 5 and 6, and enlarged in picture 7, the object of which will be explained presently. The front end sheet, shown in picture 8, is made to the dimensions given, and has one hole cut in it to receive a *tin tube*, as shown in picture 2, in which the condenser-cell or mount is inserted. This sheet must have its edges, except the bottom edge, bent round from the dotted lines, as shown, to form a little flange to give sufficient breadth of surface to be soldered to the sheet, which has been cut and bent from picture 7. You can just see this flange in picture 2. This can be bent with a pair of pliers, but slits will have to be snipped at intervals of about one inch round the curved portion at the top. The flange can also be bent by hammering it round the edge of a block of wood curved to the radius of the top. Bending at the bottom must be done to correspond with pictures 2 and 7.

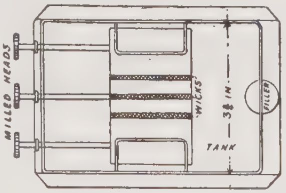
The back end piece, as shown in picture 9, comprizes a semicircular piece at the top and a hinged door, seen also in picture 6. The first is flanged similarly to the front sheet, picture 8, and soldered to the top of the lantern. But a hinge has to be made in it, and the door fitted, before the soldering is done. Both pieces are notched, as shown in the picture, and turned over a piece of wire. An enlarged detail of this is seen to the right of picture 9. This bending over is done with pliers, and finished neatly with light blows from a hammer. The edges of the door are bent backwards towards the lantern body, seen below, to embrace the sides of the latter. A hole is cut to receive a disk of blue glass, used only if limelight is employed. The glass is held in by a ring riveted over it to the door seen to the right.



15. The tank with wick for lamp

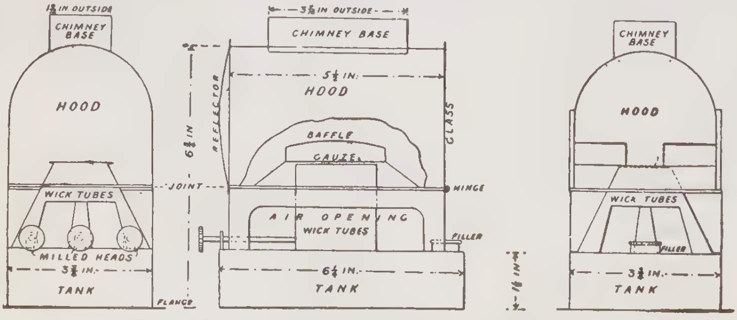


16. Bottom of hood with gauze



Picture 10 shows the bottom or floor of the lantern. It is turned up and round at the sides and front to embrace the sides and front of the body, as shown in pictures 2 and 6. The bending over is done with pliers, and may be finished by hammering, making a neat job without solder. Bent edges are seen at the bottom of picture 10. Knobs are soldered on the bottom to keep the lantern up off its support. The heads of large brass-headed nails will do for these, which are shown in pictures 2, 4, and 6. Two strips are soldered along the bottom inside, within which the foot of the lamp slides along, as seen in picture 6.

The door is fitted at one side, with a disk of blue glass in the centre, as seen in picture 4. The hinges are made separately and fitted to the door, and then soldered to the body, as in pictures 12 and 4. The glass disk is fitted as in picture 9. A fastening is made of a bit of brass, filed to the shape shown, and riveted to a pin which passes through the door and has a button on the outside to turn it by. A shop-made door is beaded, but beading may be

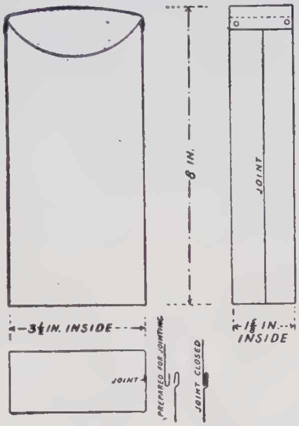


17. Four different views of the lamp for the magic lantern

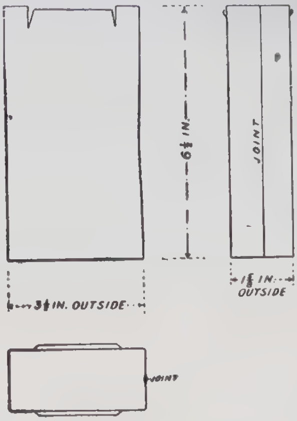
omitted if the door is made of rather stout material.

We shall now take up the connection between the lantern body and the optical tubes. This comprizes, as you will see in pictures 2 and 4, a back stage plate, a tin tube, and a front stage plate, all of which you will find shown in detail in pictures 13, 11, and 14 respectively.

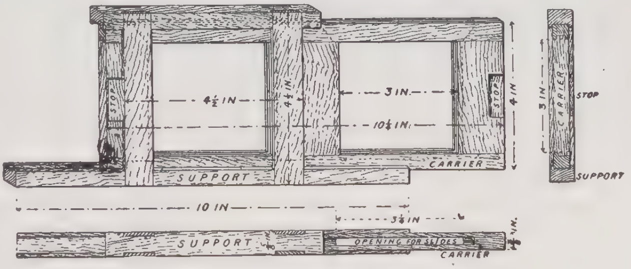
The *back stage plate*, as shown in picture 13, is made of a square sheet of tin, notched and cut at the four corners, and bent round square, the cut corners meeting. Three air-holes are also cut in each side, and the sides which are to form the top and bottom are bent round to form flanges, which are soldered to the front, as in pictures 2, 4, and 5. A little solder may be run into the corner joints.



18. Outer casing of chimney



19. Inner casing of chimney



20. The double carrier for the lantern slides

Before the plate is soldered into place, the *tin tube*, shown in picture 11, is made by bending a flange on one edge of a strip of tin, snipping it at intervals with a pair of scissors, and bending it to form a circle, soldering the joint. The flange is then soldered to the inner face of the stage plate, and the tube passes within the hole in the front plate of the lantern, as seen in picture 2. The *mount rings*, or cell, of the condenser lenses fit within the tube, sliding easily therein. The *front stage plate* is made as in picture 14. A piece of plate, cut to the dimensions given, is bent round at two ends, and at each of these ends a narrow flange is bent for soldering to the back stage plate. A hole is cut through to receive the *outer tube*, which has a narrow flange provided to be soldered to the plate, as seen also in picture 2. Four brass springs are made, and soldered by one end only, at top and bottom within the plate. These are a substitute for the more troublesome springs and pins which are fitted to shop lanterns. They yield a little on the insertion of a slide, and so accommodate their pressure to various kinds of slides which have different thicknesses. We come next to the lamp and chimney, seen in position in picture 2, and separately in pictures 15 to 19. Nearly the whole of the lamp is united by solder, and the chimney by means of joints without solder, which would become melted in the intense heat. These lamps can be purchased at a wonderfully small cost, complete with a chimney ready for use, but we describe and illustrate one for those who have plenty of time at their disposal and like to make things for themselves.

The lamp contains three wicks, each in a separate tube, for burning paraffin which is contained in the *tank* or reservoir at the bottom, poured in through a brass *filler* screwed at one end. The flanged edges of the tank slide along the ways soldered in tne bottom of the body as in picture 6. The wicks are adjusted with the milled heads, each turning a toothed wheel beside its wick. The wicks approach at the top to give one broad flame. Air enters the openings provided at the sides and ends. The smoke is consumed in hot wire gauze and baffles, within the hood above. The hood is hinged, to throw back, to permit of trimming the wicks. When closed it rests on a light framework of wire soldered to the top of the tank. At one end of the hood there is a concave polished tin reflector to throw the light on to the condenser. At the other end a sheet of plain glass protects the condenser from excess of heat. Above there is a rectangular frame soldered on, over which the lower end of the chimney fits. The hood must be of blackened sheet, but the oil-tank is of common bright tin-plate. The method of union of the parts is shown in the pictures.

The chimney, shown in pictures 18 and 19, is made in two pieces, with a *telescopic draw*. The two parts slide freely over each other. But to ensure that they shall remain as drawn out, at one end a breadth of the iron is snipped and pulled outwards to afford by its springiness a certain amount of friction. Picture 20 shows the slide-carrier, which can easily be made of wood from this design.

WHAT ANIMALS ARE THESE?

THE FIRESIDE GAME OF "WHAT-IS-ITS-NAME?"

WE have given many questions which we can read out to our friends for them to answer on pages 2362, 2523, and 2588. Here are some more puzzle questions, which deal with some of the animals that are described in the Nature section of this book. The answers are to be found on page 2875.

THE LITTLE CREATURE THAT IS MORE CLEVER THAN MAN

1. In our garden there is a beautifully-made little creature which can do things no human being can do. It makes out of its own body a rope strong enough for it to walk on, yet so fine and straight that it is used in making the most delicate optical instruments. So thin is it that one hundred of its strands make only the thickness of a hair; so strong, that it serves as a net to entrap prey, and can withstand rain, wind, frost, and heat. See, here is one of our little friends up in the attic. It has four pair of legs, a body in two pieces, and eight little eyes, so no wonder it can see all about it. What do you think it is named?

THE ARMOR-PLATED OLD MAN OF THE GARDEN

2. We find a very different animal hidden away under the lettuces. He has had one hundred and fifty birthdays and may have many more yet, for he takes life easily. He always carries his house with him. It is made of hard bony plates and a flat breastplate underneath, leaving a space in front for his head and two legs to peep out, and another at the back for his two short hind legs. If you hurt his feelings he draws back his head within his house. Let us tempt him with a nice juicy bit of lettuce. There, his slow, dull little eyes see it; he takes a bite and the piece is gone; but he may not eat again for weeks, and he goes to sleep all the winter in as cosy a corner as he can find. When he does move about he goes very slowly indeed, and many a more tiny creature could easily race him. He has a cousin who lives in a river, and another who basks on the sea-coast and who may one day be made into soup for dinner. When he himself dies his bony armor will be made into little boxes, and combs, and purses. What do we call him?

THE MOST AWKWARD ANIMAL ON THE EARTH

3. In the forests of Africa is an animal which in the course of ages has changed to suit its home. It liked to eat the leaves on the tall acacia, so it grew a long neck to reach them. Thorns of prickly plants, the leaves of which it wanted, pierced its lip, so it grew a hard skin to keep it from pricks. To protect its nose from thorns and sand blown by the wind, it learned to close its nostrils tightly. To get away from animals that attacked it, rather than fight, it lengthened its legs, so that it could outrun other animals. It is usually gentle, but sometimes gets angry and bellows. Its coat is covered with large spots. Each of the four feet has two toes, and the strong hoofs are used in fighting. Being so tall, it finds drinking very awkward, and has to straddle its legs almost like the legs of a camera. How should we like to stoop nineteen feet to drink out of a pond? Fortunately it rarely gets thirsty. What is the name of the animal?

THE JELLY THAT WRAPS ITSELF ROUND THE FOOD IT EATS

4. Living in a drop of water is a curious little creature, so simple that it is a mere speck of jelly. It has no real limbs, but it puts out "false feet" whenever it likes, and these it wraps round its food—a tiny living plant—without troubling at all about having no mouth. Its jelly-like mass thickens round the outside to form a kind of protecting wall. One peculiar thing this little creature can do is to divide itself into two new ones, each with a little dark part near its centre called the nucleus. So now it need not play about alone, for the two can float away in the water and seek their own adventures. Some of their relatives are dangerous and cause disease, another is kind and kills these when they get into our blood. What is its name?

A BIRD THAT IS NO BIRD, OR A BEAST THAT FLIES WITH ITS HANDS

5. To fly with hands! That is what we do in dreams, but there is a curious little animal that really uses its hands as wings, for it has made by the aid of its limbs a kind of parachute with which to fly. It suspends itself to the branch of a tree by hooks at the ends of its thumbs when it wants a rest, or decides to go to sleep during the winter. It likes to flit about in the twilight, and seems as though it would dash its little body against trees and houses. But no, it swerves aside, for though it has small eyes, it has large ears and a delicate sense of touch, so that it knows when danger lies ahead. It is very quick indeed in its movements in the air. It does good in our country by eating insects that are harmful. It is the only mammal that can fly like a bird. Can we tell its name?

THE ROMPING SCHOOL ON THE SURFACE OF THE SEA

6. Out at sea big dark creatures suddenly appear on the surface of the water. See, there is one. And now there are three more, tumbling about and rolling over and over. Look at the white on their under-sides. Now there is a baby one, and the whole family joins in a fine romp. A moment more, and they are all under water, diving for mackerel or herrings. They do not swim close in shore, but if we could see one near, we should find it has a very small ear, one nostril on the top of the head, and many sharp teeth in its jaws. On its back fin are little horny lumps, which remind us of the armor its ancestors used to wear. Its body contains much oil. We may have seen these creatures from a steamer round our American coasts. What are they called?

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 2869.

A GIRL'S DESPERATE RIDE

CONTINUED FROM 2668

SIR JOHN COCHRANE had been condemned to die, and was shut up in the Tolbooth prison in Edinburgh, seen in the picture. He wished his sons and daughter to refrain from visiting him, for he had joined in Argyle's insurrection against the new king, James II., and thought if his children came to see him they might lay themselves open to suspicion. But one day he had a visit from his daughter Grizel.

Father and daughter felt very sad indeed, for only one glimmer of light could they see. Sir John's father had written an appeal for pardon to the king's confessor, who had great influence over the bigoted monarch. But time was pressing. The journey to London took days to perform, and if the pardon did not come soon, Sir John must die. Even then the warrant must be on its way to Edinburgh.

While discussing the desperate situation, Grizel had an idea which she decided to act upon at once.

Early on the next day she rode south. First, she called at the cottage of her old nurse, borrowed her foster-brother's clothes, and then rode on to meet the messenger. She discovered the inn where he was staying, and entered the room where the man lay asleep, exhausted by his journey. But he was lying on the mail-bag, and she dared not attempt to draw it away. So she quietly took the charges from his pistol, mounted her horse and rode a short distance from the inn, then halted and waited for the messenger.

When the man rode up, she was ready for him. She greeted him pleasantly, and rode alongside and chatted with him. Then, sure of her ground, she quietly told him that she must have his bag. The man at first thought the youth, as she appeared to be, was joking, but he grew angry at her persistence, and when she aimed her pistol at him, fired his at her. But, to his surprize, it of course failed to go off, and his second pistol proved equally useless.

Wild with rage he dismounted and rushed at his assailant, but the girl, quick as lightning, seized his horse and galloped away with it; for was not the precious mail-bag attached to the saddle? Furiously she rode, until she reached a wood, where she opened the bag, took out the warrant, and then galloped off to her old nurse's cottage, changed her clothing, and rode back to Edinburgh.

The non-delivery of the death-warrant caused a delay which allowed time for the king to consider a bribe from Sir John's father. This he accepted, and so Sir John was saved.

AN APRONFUL OF GUNPOWDER

THIS story of Elizabeth Zane is one of those precious tales of the heroism of our great-grandmothers which we cannot forget. Her father was the leading man in his section of the Ohio wilderness and commanded the little fort built for defence against the British and their savage allies. Though there were no great battles after the surrender of Cornwallis in 1781, peace did not come to the West until years afterward.

It was an autumn day in the year 1782. Evening was slowly closing in about the little log fort. It had been attacked by Indians, and the handful of men and women within the palisades watched the descent of the sun with anxious hearts, for, in the deepening shadows of the forest beyond the clearing the enemy was hiding, watching every movement of the besieged, and ready at any moment to rush in and overwhelm them. No one in the little fort knew what deviltry the night might bring forth.

Moreover, a terrible calamity had fallen upon the garrison. They were out of powder. The men, pacing restlessly about the stockade, glanced every now and then from their empty pouches to the little group of women and children that held all most dear to them in the world, and from that out over the stockade to a little hut in the clearing. Then they swore softly to themselves.

Almost under the stockade walls in that little log hut there was an abundant supply of powder, which by some oversight had not been brought inside the fort. Two or three brave men were there, too, to defend the powder, but they were thirty yards away. In every inch of that distance death lurked from the hands of the savages watching in the shadows of the trees.

The men gathered together to talk the situation over. At last one thing was decided. They must have a keg of powder—and at once! Several of the young men eagerly offered to get it; but from the little handful no one could well be spared from his post upon the stockade, and the shadows lengthened as they talked.

Suddenly a girl's crisp, clear voice broke in upon their conference. It was the young daughter of the commander, Elizabeth Zane.

"I have heard you talking," she began decisively, "and I do not think any of your plans are any good. *I* am going for the powder."

A murmur of quick protest broke from the men.

"No," they growled, "it's a man's deed."

"Yes," returned Elizabeth calmly, "but there isn't a man who can be spared. A woman will never be missed in the defence of the fort."

Zane had been regarding his daughter thoughtfully under knit shaggy brows.

"The girl is right," he said at last gruffly in his effort to control his feeling. "Let her go."

Through the gathering shadows Elizabeth stole out of the stockade door. The anxious watchers behind the palisades saw the slim figure dart across the dusky clearing to the hut. For a moment the girl beat upon the door with white, uplifted hands. Then it was opened and she slipped within. Almost by a miracle she had reached the outpost without being discovered by the foe.

It seemed hours—though it could have been but a few minutes—before there were any signs of the door opening. Then it was pushed apart a little way and Elizabeth appeared. She seemed to be holding her checkered apron, full of something, gathered to her breast. Over the stubble field she came on flying feet. Suddenly the men in the fort gripped their useless muskets.

A wild, horrible whoop quivered through the night air. Elizabeth had been discovered. A rain of arrows and bullets flew about the little, running figure, and some shrieking savages broke from the woods in full pursuit.

Once the girl almost fell. Her father hid his face in his hands. Oh! why in God's name had they planted that field with corn in the springtime? No, she is up—her brave, little feet carrying her on—the precious bundle still clasped to her breast. She has almost reached the stockade. Open the door—quick! Strong, swift arms gather her into the fort, and slam the door,—just in time, for a pelting shower of bullets rattle upon the logs.

But who cares about bullets now? The fort is saved—for in that checkered apron gathered in Elizabeth's arms is the gunpowder that will enable them to drive away the enemy and hold the fort until help comes.

IN LAKE MICHIGAN AT MIDNIGHT

THE newspapers often contain accounts of heroic acts. The journals of August, 1906, tell the story of a brave deed by a young fellow of nineteen, one Edwin A. Crolius.

He, with four other young men, were out on a pleasure trip in a small sailing yacht on Lake Michigan. Toward night they were caught in a squall, and, after a brave fight with the wind and waves, their boat was capsized. With great difficulty, all five managed to find the overturned yacht in the darkness. For hours they clung to her, vainly hoping that some vessel would come within hailing distance, while the chill, slanting rain beat down upon them and the boat lurched and plunged in the heaving sea. Hour after hour passed, but no help came.

Once they fancied they saw a light from one of the lake schooners, and shouted into the darkness, but the rain beat the cry out of their mouths, and the light disappeared into the night. As the night passed they drifted a little toward the south, and gradually they were able to make out the misty stretch of light through the rain that told that Chicago was perhaps not more than two miles away.

Only two miles! Yet the young men were not good swimmers, and they dared not attempt to swim through the darkness, chilled and stiff as they were from hanging to the yacht for hours in the water.

The faint sound of bells tolling the midnight hour came dismally through the beating rain; and it was decided that something must be done at once, for two of their number were already shaking with cold. Crolius, the youngest of the party but the best swimmer, volunteered to swim to Chicago and secure aid. His comrades tried to dissuade him from the dangerous undertaking, but the brave young fellow replied that it was a case where one must risk death or all five would perish, and courageously set out to battle his way through the waves. After an hour of exhausting struggle against the elements, he managed to reach Chicago, and secured an immediate rescue party for his companions, who were brought safely to land. Although much exhausted, the little party suffered no ill effects from their adventure.

A BRAVE WOMAN

IN another part of our book we have mentioned the Carnegie Hero Fund Commission. Among the people who have received its medals for heroism is a woman, Marie B. Langdon. Through the bitter cold of a midwinter night, Mrs. Langdon, without snowshoes, went a long distance from her home, on hearing cries for help, and met a woman neighbor with her children, who had fled from their burning home. Mrs. Langdon relieved the woman of her baby and carried it back through the blinding snow to her home, followed by the mother, who was completely exhausted. Then Mrs. Langdon struggled back in the teeth of the storm for three-quarters of a mile, where she found the older child, whom they had been compelled to abandon. Removing her outer skirt, the big-hearted woman wrapped it around the child and started once more for home. On and on she beat her way, but the child grew heavier and heavier, and the blinding whirl of the snow confused her until she sank upon the ground. To her horror she discovered that the child was dead. The cold seemed closing in about her limbs, and for a moment she almost lost consciousness. Then realizing her danger, by a strong effort of will she regained her senses, and laying the child gently in the snow, she managed to battle her way through the night back to her own home.

THE BRAVE CONSTABLE OF FRANCE

DU GUESCLIN is a name honored by the French, for he was the hero of their country in the warlike Middle Ages, and French boys and girls delight in stories of what he did and said.

Bertrand du Guesclin was born between 1314 and 1320 in a castle in Brittany, and as a boy he cannot have been a very agreeable playmate—for he was obstinate, sullen, quarrelsome, and ever ready to fight. An old chronicler says he was the ugliest boy between Rennes and Dinant, that he roamed about with peasant boys, and could not be taught to read. It cannot be denied that he was headstrong and restless. At sixteen he ran away from home.

But for all his troublesome ways, the boy had in him the making of a great and clever general. He became a strong man, a brave soldier, a devoted patriot, and a defender of his country, a foe worthy of the Black Prince, so that his countrymen used to boast that they possessed the bravest general in Europe. Du Guesclin fought first in the War of Succession in Brittany, and then attracted the attention of his king, Charles V., who saw in him the very leader needed to drive the English out of France. After the Treaty of Bretigny, the free-lances, who were soldiers paid to fight for others, were disbanded and wandered about, plundering and slaying the inhabitants. The country was in a dreadful state, so King Charles bade Du Guesclin rid the land of these robber soldiers. Then the Breton gathered these men of the robber bands together and led them in an expedition against Pedro, the cruel King of Castile, who was ruling so badly that one of his half-brothers had come to beg King Charles's aid in turning him off the throne.

THE GREAT BERTRAND

Du Guesclin was successful; but when the Black Prince was sent by Edward III. of England to help the defeated Pedro, some of the soldiers went back to the side of their favorite leader, the Black Prince, so that Du Guesclin was defeated and captured at the battle of Navaretta, near the Ebro, in 1367. He was taken a prisoner to Bordeaux, where he soon grew tired of the irksome captivity.

It is said that one day the Black Prince met Du Guesclin in the town, and, going up to him, said:

"How do you do, Bertrand?"

"Well," replied Du Guesclin, "for they say I am the greatest knight in all the world, since you dare not allow me to be ransomed."

Nettled at this, the English prince told the prisoner to fix his own ransom.

"A hundred thousand livres," replied Du Guesclin.

This was an immense sum for those times; so the Black Prince asked in astonishment where he could get all that money. The reply was: "There is not a spinner in France who would not spin a distaff full to help to pay my ransom."

The French people did soon ransom Du Guesclin. Charles made him Constable of France, and, after the death of the Black Prince, he gradually freed his native land. When Du Guesclin was besieging a castle in Languedoc, the English governor promised to surrender it on a certain day if he were not relieved before. The Constable fell ill, and died before the day appointed for surrender, so that he could not take the castle. But the English governor refused to dishonor his word, marched with his garrison to the enemy's camp, and laid the keys of the castle on the dead hero's bier.

Du Guesclin's last words were: "Never forget that, wherever you wage war, the clergy, the women, the children, and the poor are not your enemies." And this was the humane principle that the brave and chivalrous warrior followed in all his campaigns and battles.

THE NEXT GOLDEN DEEDS ARE ON PAGE 2999.

THE NORMAN BARON

In this fine poem by Henry W. Longfellow, our great American poet has taken a subject from the history of England in the early Middle Ages. He was very fond of choosing themes from English history, for, of course, an American poet has fewer incidents to choose from in American history, and must look to the old land of legend and romance for inspiring subjects of song. Longfellow prefixes to his poem a passage from a French history of the Conquest of England, which may be translated thus : " In those moments of life when the thoughts of man become more calm and deepen, and the voice of selfishness speaks less strongly than the voice of reason, when overcome by domestic sorrow, by illness, or under the shadow of death, the barons sometimes repented of having enslaved the people, and felt they had done a thing displeasing to God, who had created all men in His image." The poet, perhaps, overpraises the Norman baron's death-bed repentance, though it was a case of " better late than never."

CONTINUED FROM 2747

In his chamber, weak and dying,
Was the Norman baron lying ;
Loud, without, the tempest thundered,
And the castle turret shook.

In this fight was Death the gainer,
Spite of vassal and retainer,
And the lands his sires had plundered,
Written in the Domesday Book

By his bed a monk was seated,
Who in humble voice repeated
Many a prayer and paternoster,
From the missal on his knee.

And, amid the tempest pealing,
Sounds of bells come faintly stealing,
Bells that, from the neighbouring cloister,
Rang for the Nativity.

In the hall, the serf and vassal
Held, that night, their Christmas wassail ;
Many a carol, old and saintly,
Sang the minstrels and the waits.

And so loud these Saxon gleemen
Sang to slaves the songs of freemen,
That the storm was heard but faintly,
Knocking at the castle gates.

Till at length the lays they chaunted
Reached the chamber terror-haunted,
Where the monk, with accents holy,
Whispered at the baron's ear.

Tears upon his eyelids glistened,
As he paused awhile and listened,
And the dying baron slowly
Turned his weary head to hear.

" Wassail for the kingly stranger
Born and cradled in a manger !
King, like David, priest, like Aaron,
Christ is born to set us free ! "

And the lightning showed the sainted
Figures on the casement painted,
And exclaimed the shuddering baron,
" Miserere, Domine ! "

In that hour of deep contrition,
He beheld, with clearer vision,
Through all outward show and fashion,
Justice, the Avenger, rise.

All the pomp of earth had vanished,
Falsehood and deceit were banished,
Reason spoke more loud than passion,
And the truth wore no disguise.

Every vassal of his banner,
Every serf born to his manor,
All those wronged and wretched creatures,
By his hand were freed again.

And, as on the sacred missal
He recorded their dismissal,
Death relaxed his iron features,
And the monk replied, " Amen ! "

Many centuries have been numbered
Since in death the baron slumbered
By the convent's sculptured portal,
Mingling with the common dust.

But the good deed, through the ages
Living in historic pages,
Brighter glows and gleams immortal,
Unconsumed by moth or rust.

THE SONG OF THE SHIRT

Thomas Hood, one of the most lovable of English poets, was equally great in comic and serious verse. We have already read three of his poems in our book, and that given here is one that will never be forgotten. Only a powerful poet whose heart had bled for the poor and oppressed could have written these moving and burning verses. It is well to remember in reading them that their author could make us laugh as few other poets have ever done, and that it is usually those who see the comic side of life that can best understand and express its serious and tender side.

WITH fingers weary and worn,
With eyelids heavy and red,
A woman sat, in unwomanly rags,
Plying her needle and thread—
Stitch—stitch—stitch!
In poverty, hunger, and dirt,
And still with a voice of dolorous pitch
She sang the "Song of the Shirt!"

"Work—work—work!
While the cock is crowing aloof;
And work—work—work
Till the stars shine through the roof!
It's oh! to be a slave
Along with the barbarous Turk,
Where woman has never a soul to save
If this is Christian work!

"Work—work—work!
Till the brain begins to swim;
Work—work—work
Till the eyes are heavy and dim!
Seam, and gusset, and band—
Band, and gusset, and seam—
Till over the buttons I fall asleep
And sew them on in a dream!

"Oh, men with sisters dear!
Oh, men with mothers and wives!
It is not linen you're wearing out,
But human creatures' lives!
Stitch—stitch—stitch,
In poverty, hunger, and dirt,
Sewing at once with a double thread
A shroud as well as a shirt.

"But why do I talk of Death?
That phantom of grisly bone,
I hardly fear his terrible shape,
It seems so like my own—
It seems so like my own,
Because of the fasts I keep;
O God! that bread should be so dear,
And flesh and blood so cheap!

"Work—work—work!
My labour never flags;
And what are its wages? A bed of straw,
A crust of bread—and rags.
That shattered roof, and this naked floor,
A table, a broken chair—
And a wall so blank, my shadow I thank
For sometimes falling there.

"Work—work—work!
From weary chime to chime,
Work—work—work
As prisoners work for crime!
Band, and gusset, and seam—
Seam, and gusset, and band—
Till the heart is sick, and the brain benumbed,
As well as the weary hand.

"Work—work—work!
In the dull December light,
And work—work—work
When the weather is warm and bright;
While underneath the eaves
The brooding swallows cling,
As if to show me their sunny backs,
And twit me with the spring.

"Oh! but to breathe the breath
Of the cowslip and primrose sweet—
With the sky above my head,
And the grass beneath my feet!
For only one short hour
To feel as I used to feel,
Before I knew the woes of want
And the walk that costs a meal!

"Oh! but for one short hour!
A respite however brief!
No blessed leisure for love or hope,
But only time for grief!
A little weeping would ease my heart;
But in their briny bed
My tears must stop, for every drop
Hinders needle and thread!"

With fingers weary and worn,
With eyelids heavy and red,
A woman sat, in unwomanly rags,
Plying her needle and thread—
Stitch—stitch—stitch!
In poverty, hunger, and dirt,
And still with a voice of dolorous pitch—
Would that its tone could reach the rich!—
She sang this "Song of the Shirt!"

THE ANGELS' WHISPER

Samuel Lover, born in Dublin, February 24, 1797, and died July 6, 1868, was a celebrated Irishman who did many things well. He began life as an artist, wrote two famous novels, some plays, many charming songs, and was a successful entertainer. This is one of his best-known songs, and even young readers will at once recognize the melody of its verse and the tender feeling it so beautifully expresses.

A BABY was sleeping,
Its mother was weeping,
For her husband was far on the wild raging sea;
And the tempest was swelling
Round the fisherman's dwelling,
And she cried: "Dermot, darling, oh, come back to me!"

Her beads while she numbered
The baby still slumbered,
And smiled in her face as she bended her knee.
"Oh, blessed be that warning,
My child, thy sleep adorning,
For I know that the angels are whispering with thee.

"And while they are keeping
Bright watch o'er thy sleeping,
Oh, pray to them softly, my baby, with me,
And say thou would'st rather
They'd watch o'er thy father,
For I know that the angels are whispering with thee."

The dawn of the morning
Saw Dermot returning,
And the wife wept with joy her babe's father to see,
And closely caressing
Her child, with a blessing,
Said: "I knew that the angels were whispering with thee."

THE LAY OF THE LAST MINSTREL

This is another and very familiar example of Sir Walter Scott's romantic poetry. The scene of the story is the borderland between England and Scotland, where Sir Walter lived, and whose legends he loved to relate. The words of the minstrel's own song are not given here. The minstrel of the past was one of the many picturesque figures that vanished with the changing ages, and we fear that the wandering singers and musicians of our own time are poor substitutes for him.

THE way was long, the wind was cold ;
The Minstrel was infirm and old ;
His withered cheek, and tresses grey,
Seemed to have known a better day ;
The harp, his sole remaining joy,
Was carried by an orphan boy.
The last of all the bards was he,
Who sung of Border chivalry ;
For, well-a-day ! their date was fled ;
His tuneful brethren all were dead ;
And he, neglected and oppressed,
Wished to be with them, and at rest.

No more, on prancing palfrey borne,
He carolled, light as lark at morn ;
No longer courted and caressed,
High placed in hall, a welcome guest,
He poured to lord and lady gay
The unpremeditated lay.
Old times are changed, old manners gone,
A stranger filled the Stuarts' throne ;
The bigots of the iron time
Had called his harmless act a crime ;
A wandering harper, scorned, and poor,
He begged his bread from door to door,
And tuned, to please a peasant's ear,
The harp a king had loved to hear.

He passed where Newark's stately tower
Looks out from Yarrow's birchen bower ;
The Minstrel gazed with wistful eye ;
No humbler resting-place was nigh.
With hesitating step, at last,
The embattled portal-arch he passed,
Whose ponderous grate and massy bar
Had oft rolled back the tide of war ;
But never closed the iron door
Against the desolate and poor.
The duchess marked his weary pace,
His timid mien and reverend face,
And bade her page the menials tell,
That they should tend the old man well ;
For she had known adversity,
Though born in such a high degree ;
In pride of power, in beauty's bloom
Had wept o'er Monmouth's bloody tomb !

When kindness had his wants supplied,
And the old man was gratified,
Began to rise his minstrel pride :
And he began to talk anon,
Of good Earl Francis, dead and gone,
And of Earl Walter—rest him God !—
A braver ne'er to battle rode :
And how full many a tale he knew
Of the old warriors of Buccleuch ;
And would the noble duchess deign
To listen to an old man's strain,
Though stiff his hand, his voice though weak,
He thought e'en yet, the sooth to speak,
That, if she loved the harp to hear,
He could make music to her ear.

The humble boon was soon obtained ;
The agèd Minstrel audience gained.
But, when he reached the room of state,
Where she with all her ladies sate,
Perchance he wished his boon denied ;
For, when to tune his harp he tried,
His trembling hand had lost the ease
Which marks security to please ;
And scenes, long past, of joy and pain,
Came wildering o'er his agèd brain,
He tried to tune his harp in vain.
The pitying duchess praised its chime,
And gave him heart, and gave him time,
Till every string's according glee
Was blended into harmony.
And then, he said, he would full fain
He could recall an ancient strain,
He never thought to sing again ;
It was not framed for village churls,
But for high dames and mighty earls ;
He had played it to King Charles the Good,
When he kept court in Holyrood ;
And much he wished, yet feared to try,
The long-forgotten melody.

Amid the strings his fingers strayed,
And an uncertain warbling made ;
And oft he shook his hoary head.
But when he caught the measure wild
The old man raised his face and smiled ;
And lightened up his faded eye
With all a poet's ecstasy !
In varying cadence, soft or strong,
He swept the sounding chords along ;
The present scene, the future lot—
His toils, his wants—were all forgot.
Cold diffidence, and age's frost,
In the full tide of song were lost ;
Each blank, in faithless memory void,
The poet's glowing thought supplied ;
And, while his harp responsive rung,
'Twas thus the latest Minstrel sung.

. . . . .

Hushed is the harp—the Minstrel gone
And did he wander forth alone ?
Alone, in indigence and age,
To linger out his pilgrimage ?
No. Close beneath proud Newark's tower
Arose the Minstrel's lowly bower ;
A simple hut ; but there was seen
The little garden hedged with green,
The cheerful hearth, and lattice clean.

. . . . .

So passed the winter's day, but still,
When summer smiled on sweet Bowhill,
And July's eve, with balmy breath,
Waved the bluebells on Newark heath ;
When throstles sung on Harehead shaw,
And corn waved green on Carterhaugh,
And flourished broad, Blackandro's oak,
The agèd harper's soul awoke !
Then would he sing achievements high
And circumstance of chivalry,
Till the rapt traveller would stay,
Forgetful of the closing day ;
And noble youths, the strain to hear,
Forsook the hunting of the deer ;
And Yarrow, as he rolled along,
Bore burden to the Minstrel's song.

TO A WATERFOWL

William Cullen Bryant, who was born at Cummington, in the State of Massachusetts, November 3, 1794, and died in New York, June 12, 1878, was one of the greatest poets America has produced. In his poetry we find a deep understanding of Nature and a steady, serene faith in the Providence which guides the wondrous life of earth. The manner of his poetry is, however, rather that of a scholar than of one who sings direct his untaught thoughts of Nature. In the following poem these qualities are all displayed.

WHITHER, midst falling dew,
While glow the heavens with the last steps of day,
Far, through their rosy depths, dost thou pursue
Thy solitary way?

Vainly the fowler's eye
Might mark thy distant flight to do thee wrong,
As, darkly painted on the crimson sky,
Thy figure floats along.

Seek'st thou the splashy brink
Of weedy lake, or marge of river wide,
Or where the rocking billows rise and sink
On the chafed ocean-side?

There is a Power whose care
Teaches thy way along that pathless coast—
The desert and illimitable air—
Lone wandering, but not lost.

All day thy wings have fanned,
At that far height, the cold, thin atmosphere.
Yet stoop not, weary, to the welcome land,
Though the dark night is near.

And soon that toil shall end;
Soon shalt thou find a summer home and rest,
And scream among thy fellows; reeds shall bend
Soon o'er thy sheltered nest.

Thou'rt gone, the abyss of heaven
Hath swallowed up thy form; yet, on my heart
Deeply hath sunk the lesson thou hast given,
And shall not soon depart.

He who, from zone to zone,
Guides through the boundless sky thy certain flight
In the long way that I must tread alone,
Will lead my steps aright.

A TERNARIE OF LITTLES

The word "ternarie" signifies a group of any three things, each of which may be different. Thus Robert Herrick, whose famous poem, "Fair Daffodils," we read on page 2131, has given the above title to these very dainty verses because in each one of them he mentions three "littles."

A LITTLE saint best fits a little shrine,
A little prop best fits a little vine;
As my small cruse best fits my little wine.

A little seed best fits a little soil,
A little trade best fits a little toil;
As my small jar best fits my little oil.

A little bin best fits a little bread,
A little garland fits a little head;
As my small stuff best fits my little shed.

A little hearth best fits my little fire,
A little chapel fits a little choir;
As my small bell best fits my little spire.

A little stream best fits a little boat,
A little lead best fits a little float;
As my small pipe best fits my little note.

BABYLAND

This charming little poem recalls the children's verses of the late Eugene Field, which we know so well, but it is not by him, having been written by an author named George Cooper.

"HOW many miles to Babyland?"
"Any one can tell!
Up one flight;
To the right.
Please to ring the bell."

"What can you see in Babyland?"
"Little folks in white—
Downy heads,
Cradle-beds,
Faces pure and bright."

"What do they do in Babyland?"
"Dream and wake, and play,
Laugh and crow,
Shout and grow.
Jolly times have they!"

"What do they say in Babyland?"
"Why, the oddest things!
Might as well
Try to tell
What a birdie sings!"

"Who is the Queen of Babyland?"
"Mother, kind and sweet;
And her love,
Born above,
Guides the little feet."

THE RIVER

Poets have ever loved to write of flowing streams, for there is nothing in Nature so charged with poetry and the mystery of life as the river on its way to the sea. It is the commonest illustration of this moving, changeful life of ours, and has been used in many different ways, as suits the poet's mood. We saw with what dramatic power Kingsley wrote of the river in his poem on page 2664, while Tennyson in "The Brook," on page 103, and Southey in "The Cataract of Lodore," on page 1292, deal with the poetry of rushing water with wonderful effect. But the following is just a pretty song by Mr. Frederic E. Weatherly, who turns the river and its music into a soothing melody of gentle life.

WHERE do you come from, river sweet?
Whence do your wavelets roam?
Is it a lake, or a mountain brake,
Where fairies make their home?
Is it a land where children play,
Or old folks dream at close of day?
"Nay," said the river, whispering low,
"It is from Babyland I flow!"

Why do you hurry, O river fleet?
Can you not stay your stream,
And waft me tenderly soft and sweet
Back to that land of dream?
Can we not turn and play once more
In Babyland, as we played of yore?
"Nay," said the river, "that may not be,
There's no returning for you or me!"

Whither away, I cried again,
Whither away, O stream?
Do you rest at last when your journey's past
In some beautiful land of dream?
Is it a land that we may know,
And find the peace of the long ago?
"Yes," said the river, "a land that's blest;
'Tis the land of love and eternal rest!"

THE BELLS. By Edgar Allan Poe

Edgar Allan Poe is one of the most remarkable poets America has produced, and, with the exception of Walt Whitman, the most individual genius in American poetry. He was born in Boston, Massachusetts, on January 19, 1809, and died in Baltimore, on October 17, 1849, after an unsettled and disastrous life. No modern poet or writer of fiction has excelled him in weird and "uncanny" imaginings. He is also a great master of word melody. In the following famous poem, which has long been popular as a recitation by reason of its dramatic force, one can see how the verse steadily increases in its measure of music and changes in character from the jingling sound of the light sledge-bells to the far-resounding noise of the great city bells ringing in the still night.

I.

HEAR the sledges with the bells—
Silver bells!
What a world of merriment their melody foretells!
How they tinkle, tinkle, tinkle,
In the icy air of night!
While the stars that oversprinkle
All the heavens seem to twinkle
With a crystalline delight;
Keeping time, time, time,
In a sort of Runic rhyme,
To the tintinnabulation that so musically swells
From the bells, bells, bells, bells,
Bells, bells, bells—
From the jingling and the tinkling of the bells.

II.

Hear the mellow wedding bells,
Golden bells!
What a world of happiness their harmony foretells!
Through the balmy air of night
How they ring out their delight!—
From the molten golden notes,
And all in tune,
What a liquid ditty floats
To the turtle-dove that listens, while she gloats
On the moon!
Oh, from out the sounding cells,
What a gush of euphony voluminously wells!
How it swells,
How it dwells
On the Future; how it tells
Of the rapture that impels
To the swinging and the ringing
Of the bells, bells, bells,
Of the bells, bells, bells, bells,
Bells, bells, bells—
To the rhyming and the chiming of the bells!

III.

Hear the loud alarum bells—
Brazen bells!
What a tale of terror now, their turbulency tells;
In the startled air of night
How they scream out their affright!
Too much horrified to speak,
They can only shriek, shriek,
Out of tune,
In the clamorous appealing to the mercy of the fire,
In the mad expostulation with the deaf and frantic fire.
Leaping higher, higher, higher,
With a desperate desire,
And a resolute endeavour
Now—now to sit or never,
By the side of the pale-faced moon.
Oh, the bells, bells, bells!
What a tale their tenor tells
Of Despair!
How they clang and crash and roar!
What a horror they outpour
On the bosom of the palpitating air!
Yet the air it fully knows,
By the twanging,
And the clanging,
How the danger ebbs and flows;
Yet the air distinctly tells,
In the jangling,
And the wrangling,
How the danger sinks and swells,
By the sinking or the swelling in the anger of the bells—
Of the bells—
Of the bells, bells, bells, bells,
Bells, bells, bells—
In the clamour and the clangour of the bells!

IV.

Hear the tolling of the bells—
Iron bells!
What a world of solemn thought their melody compels!
In the silence of the night,
How we shiver with affright
At the melancholy menace of their tone;
For every sound that floats
From the rust within their throats
Is a groan.
And the people—ah, the people—
They that dwell up in the steeple,
All alone,
And who tolling, tolling, tolling,
In that muffled monotone,
Feel a glory in the rolling
On the human heart a stone—
They are neither man nor woman—
They are neither brute nor human,
They are Ghouls:
And their king it is who tolls;
And he rolls, rolls, rolls,
Rolls
A pæan from the bells!
And his merry bosom swells
With the pæan from the bells!
And he dances and he yells;
Keeping time, time, time,
In a sort of Runic rhyme,
To the throbbing of the bells—
Of the bells, bells, bells—
To the sobbing of the bells;
Keeping time, time, time,
As he knells, knells, knells,
In a happy Runic rhyme,
To the rolling of the bells—
Of the bells, bells, bells—
To the tolling of the bells,
Of the bells, bells, bells, bells—
Bells, bells, bells—
To the moaning and the groaning of the bells.

SAY NOT THE STRUGGLE NAUGHT AVAILETH

Arthur Hugh Clough is one of the most noteworthy among the lesser poets of England. Born at Liverpool on New Year's Day, 1819, he died at Florence, November 13, 1861. His poetry is not only beautiful in form but is weighted with thought, and these four short verses make up a little gem of poetic form and enlarging thought.

SAY not the struggle naught availeth,
  The labour and the wounds are vain;
The enemy faints not, nor faileth,
  And as things have been they remain.

If hopes were dupes, fears may be liars;
  It may be, in yon smoke concealed,
Your comrades chase e'en now the fliers,
  And, but for you, possess the field.

For while the tired waves, vainly breaking,
  Seem here no painful inch to gain,
Far back, through creeks and inlets making,
  Comes silent, flooding in, the main.

And not by eastern windows only,
  When daylight comes, comes in the light;
In front the sun climbs slow, how slowly!
  But westward, look, the land is bright!

THE INDUSTRY OF ANIMALS

We here give another of the poems of Thomas Miller, the poor basket-maker who became a poet and author of some note and whose writings are always of a pure and elevating character.

THE lute-voice birds rise with the light,
  Their nestling young to feed,
Pursue the insects in their flight,
  Or pluck the feathery seed.

The golden-belted humming-bee
  Goes toiling hour by hour,
Over the moor and distant lea,
  Wherever grows a flower.

With weary journeys up and down,
  He home his honey brings,
From gardens in the distant town,
  And while he labours sings.

The long-tailed field-mouse to the wood
  Makes journeys many a score,
And in a granary piles his food,
  And hoards his wintry store.

Within the hollow of a tree
  The nimble squirrel hides
His meat and nuts right cunningly,
  And for the cold provides.

His home the mole makes underground,
  With runs and chambers crossed
And galleries circling round and round,
  In which you would be lost.

Although the swallow in her nest
  Displays such art and skill,
She has no tools save her white breast,
  And small sharp-pointed bill.

There's not an insect crawls or flies
  But what has work to do,
And the same God their wants supplies
  Who watcheth over you.

No single thing did God create
  But He for it gave food,
And whether it be small or great,
  " He saw that it was good."

AULD LANG SYNE

There is probably no song in any language that has ever attained such a world-wide and enduring popularity as this famous song, partly, if not entirely, written by Robert Burns. Like most of his popular songs these words were composed for an old tune, though not for the tune to which it is usually sung, that being also an old Scots melody. It is the homely and human sentiment of the song that has won for it universal favor, even among people who are only dimly conscious of the real meaning of the old Scots words. There are many of these words in it that require some explanation, but we need only say that it is a song in praise of friendship and "old time's sake."

SHOULD auld acquaintance be forgot,
  And never brought to mind?
Should auld acquaintance be forgot,
  And auld lang syne?

    For auld lang syne, my jo,
      For auld lang syne,
    We'll tak' a cup o' kindness yet,
      For auld lang syne.

And surely ye'll be your pint-stoup,
  And surely I'll be mine;
And we'll tak' a cup o' kindness yet,
  For auld lang syne.

We twa hae run about the braes,
  And pu'd the gowans fine;
But we've wander'd mony a weary fit
  Sin' auld lang syne.

We twa hae paidled i' the burn
  Frae morning sun till dine;
But seas between us braid hae roar'd
  Sin' auld lang syne.

And there's a hand, my trusty fiere,
  And gie's a hand o' thine;
And we'll tak' a right gude-willie waught,
  For auld lang syne.

LITTLE WHITE LILY

Dr. George Macdonald contrives in these pretty little verses to state a simple fact from the life of the flowers in language that is at once child-like and yet perfectly expressive. It would be a good thing if some grown-up people who are fond of using needlessly long words, in the hope of appearing wise, would learn from this poem how much can be said in words that a child uses every day.

LITTLE white Lily
  Sat by a stone,
Drooping and waiting
  Till the sun shone.
Little white Lily
  Sunshine has fed;
Little white Lily
  Is lifting her head.

Little white Lily
  Said: " It is good;
Little white Lily's
  Clothing and food."
Little white Lily
  Drest like a bride!
Shining with whiteness,
  And crown'd beside!

Little white Lily
  Droopeth with pain,
Waiting and waiting
  For the wet rain.
Little white Lily
  Holdeth her cup,
Rain is fast falling
  And filling it up.

Little white Lily
  Said: " Good again,
When I am thirsty
  To have nice rain;
Now I am stronger,
  Now I am cool;
Heat cannot burn me,
  My veins are so full."

Little white Lily
  Smells very sweet:
On her head sunshine,
  Rain at her feet.
" Thanks to the sunshine,
  Thanks to the rain!"
Little white Lily
  Is happy again!

LITTLE·VERSES·FOR·VERY·LITTLE·PEOPLE·

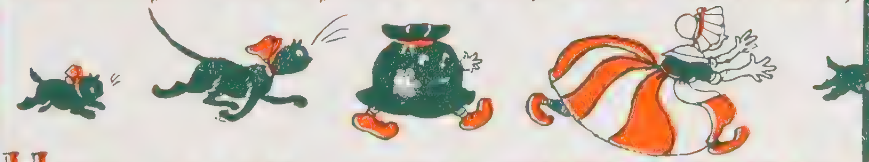
As I was going to St Ives,
I met a man with seven wives;

Every wife had seven sacks,

Every sack had seven cats;

Every cat had seven kits:

Kits, cats, sacks, and wives,



How many were there going
to St Ives ? ? ? ?

S. C. Burnside

For want of the nail the shoe was lost

For want of the shoe the horse was lost

For want of the horse the rider was lost;

For want of the rider the battle was lost;

For want of the battle the kingdom was lost;
And all for the want of a horse-shoe nail.

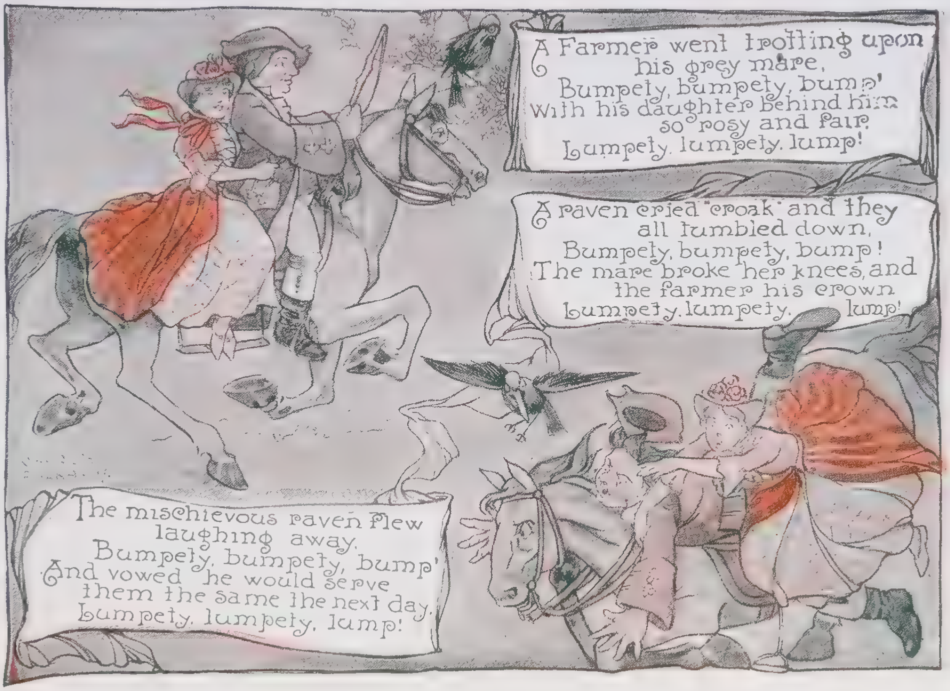
AS I went to Bonner,
I met a pig
Without a wig,
Upon my word and honor.

THERE was a jolly miller
Lived on the River Dee;
He worked and sang from morn till night,
No lark so blithe as he;
And this the burden of his song
For ever used to be—
I jump mejerrime jee!
I care for nobody—no! not I,
Since nobody cares for me.

WE are all in the dumps,
For diamonds are trumps,
The kittens are gone to St. Paul's,
The babies are bit,
The moon's in a fit,
And the houses are built without walls.

WHAT is the news of the day,
Good neighbor, I pray?
They say the balloon
Is gone up to the moon!

MARCH winds and April showers
Bring forth May flowers.

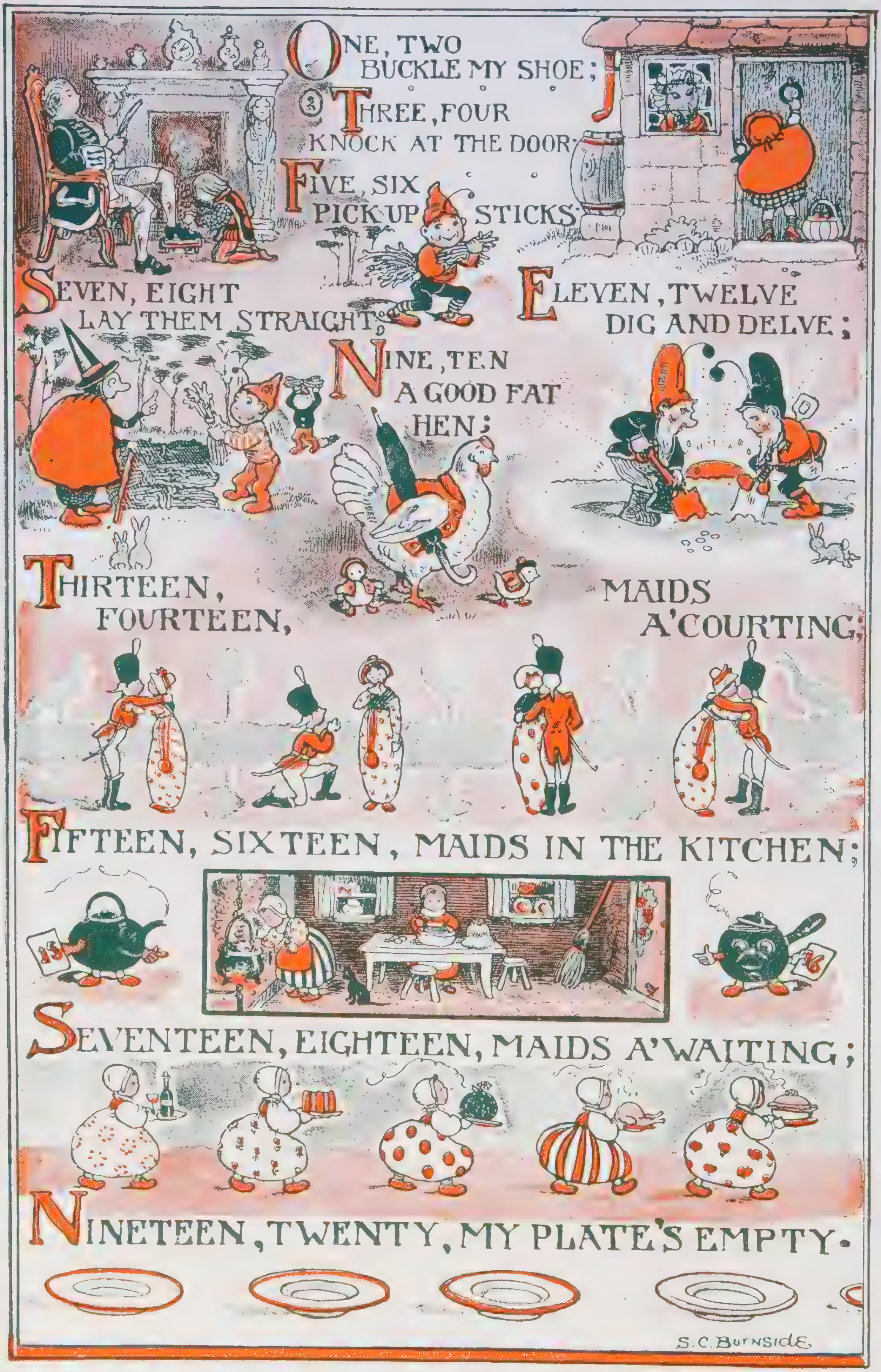

A Farmer went trotting upon his grey mare,
Bumpety, bumpety, bump!
With his daughter behind him so rosy and fair,
Lumpety, lumpety, lump!
A raven cried "croak" and they all tumbled down,
Bumpety, bumpety, bump!
The mare broke her knees, and the farmer his crown
Lumpety, lumpety, lump!
The mischievous raven flew laughing away,
Bumpety, bumpety, bump!
And vowed he would serve them the same the next day,
Lumpety, lumpety, lump!

HIGH diddle ding,
Did you hear the bells ring?
The Parliament soldiers are gone to the King!
Some they did laugh, some they did cry,
To see the Parliament soldiers pass by.

WEE Willie Winkie runs through the town,
Upstairs and downstairs in his night-gown,
Rapping at the window, crying through the lock,
"Are the children in their beds, for now it's eight o'clock?"

ONE misty, moisty morning,
When cloudy was the weather,
There I met an old man
Clothed all in leather;
Clothed all in leather,
With cap under his chin—
How do you do, and how do you do,
And how do you do again?

HECTOR PROTECTOR was dressed all in green;
Hector Protector was sent to the Queen.
The Queen did not like him,
No more did the King;
So Hector Protector was sent back again.



ONE, TWO
BUCKLE MY SHOE;
THREE, FOUR
KNOCK AT THE DOOR;
FIVE, SIX
PICK UP STICKS;
SEVEN, EIGHT
LAY THEM STRAIGHT;
NINE, TEN
A GOOD FAT
HEN;
ELEVEN, TWELVE
DIG AND DELVE;
THIRTEEN,
FOURTEEN,
MAIDS
A'COURTING;
FIFTEEN, SIXTEEN, MAIDS IN THE KITCHEN;
SEVENTEEN, EIGHTEEN, MAIDS A'WAITING;
NINETEEN, TWENTY, MY PLATE'S EMPTY.

The Book of OUR OWN LIFE

WHAT THIS STORY TELLS US

WE have learnt what are the various kinds of things which either must be included in our diet on pain of death or, like sugar and fat, are extremely desirable, though not quite necessary for life. But, as a rule, the foods which we eat do not consist of, say, pure proteid, about which we read on page 2731, but of a great mixture of food-stuffs, together with a quantity of material which cannot be digested at all, and usually with a great admixture of water. We now begin to study some of our common foods to see how they rank when they are examined chemically, and to learn how far we are wise in using them. We may find, for instance, that clear beef-extract, which is regarded as a food by many people, contains none of the substances necessary for life except water and salt; and with people for whom money is scarce, this is a very important thing to know.

NATURE'S WONDERFUL FOOD

CONTINUED FROM 2732

THERE is only one instance in which Nature has set out to make a food. The wheat plant grows, and produces food material in its grain, not for the sake of the children of men, but for the sake of the children of wheat. The fish, the sheep, the chicken, and the egg come into existence as part of the life of the living races to which they belong. The time is for ever past when we can have the folly to imagine that the only purpose these things have is to serve us. If we leave ourselves out of the question altogether, we still find that throughout the whole of Nature, with one exception, the animal and vegetable food of living creatures was not first brought into being to be a food, but was brought into being for itself, to live its own life. Only once has Nature set out to make a food—a substance brought into being and existing only in order to be a food.

We may reasonably expect that this food will be hard to beat, that it will contain everything necessary for life, and that it will contain these things in the exact proportions that are needed. That is precisely what we find. There are as many kinds of milk as there are kinds of mammalian animals, or mammals. The word comes from *mamma*, which is the proper name for the udder of a cow. In each case the young creature has different needs. It may be a young whale, or a young antelope or a young human being. These lead different lives in different surroundings and different temperatures; they develop at different rates, and therefore the milk provided for these creatures differs suitably in each case. More than this, it differs from week to week, or month to month, according to the needs of different stages of development in the young creature.

The needs of all life are really the same. Every kind of milk that exists contains proteid, sugar, fat, and various salts; but the proportions of these things differ. Now, the milk we are to study here is cow's milk, simply because that is what we usually drink; and though we said that milk is a perfect food, we are to understand that each milk is a *perfect* food only for the creature for whom it was made. The cow's milk was made for the calf, for whom it is a food perfect and complete; it is not so for the human baby, nor for grown-up human beings, nor even for grown-up cattle. The objection to it in the case of ourselves, when we are grown up, is only a slight one, namely, that it is rather too dilute, which means that it contains more water than is quite convenient. Yet no one can name any other food that is so nearly perfect even for grown-up human beings as cow's milk, and people can live upon it and recover health from it after the gravest disease without the help of anything else.

Milk and its products, especially

cream, ought to be the great staple of the diet of children. No baby, of course, could survive without milk; and the needs of the small baby, as it grows older, do not change so quickly as some people suppose. The commonest mistake in the feeding of children in the second and third and fourth year in America is not giving them enough milk.

Nothing could be a greater mistake than to judge the value of foods by their stiffness and solidity. Plaster of Paris is stiff, and milk is not; milk is a perfect food, and plaster of Paris is no food at all. We underestimate the value of milk simply because it is a fluid, but we do not suppose that a lump of sugar is lost when it is melted in a cup of tea. We quite understand that the sugar is still there and that we are getting it. Now, milk is really made of various things, just as solid as a lump of sugar, which have been melted in water simply for convenience. Directly milk is swallowed, it is promptly turned into solids, or is clotted, as we say. This is done by a ferment in the stomach. It is well to add a little rennet, which is really the same ferment, to a glass of milk, so as to satisfy ourselves that milk is really " solid nourishment."

THE THINGS THAT MAKE UP THE GREAT VALUE OF MILK AS FOOD

When milk clots, in the stomach or outside it, it forms a curd, which consists of most of the proteid of the milk and all the fat. The clear whey which is left contains the sugar, the salts, and a small part of the proteid of the milk. It follows from this that it is possible to live on whey, and, though it is rather a thin kind of nourishment, it saves the life of many a baby who can use nothing else. But no one could possibly live on curd only. Let us consider for ourselves what it is that curd lacks which is necessary for life, and which whey, though it looks so poor compared with curd, contains. The particular proteid in whey—without which, of course, it could not sustain life—is perfectly well known to all of us. For when we boil milk it slowly stiffens, and forms the " skin " on the top, which a few grown-up people and many children throw away, but which is one of the most valuable things in milk. The sugar of milk is a special sugar which is not found anywhere else. It is rather less sweet than the sugar we put in tea. It has the beautiful property of being far less ready to be broken up by microbes than any other sugar. The invaluable salts of milk, upon which bones and teeth, to mention nothing else, depend, always include the following elements: potassium, sodium, calcium, magnesium, iron, phosphorus, and chlorine. The proportion of potassium is strikingly high because that is specially required for the growth of muscle; as for the lime or calcium, no other food, except yolk of egg, contains so much.

ONE OF THE COMMON DANGERS OF THE COMMON USE OF MILK

Milk is very apt to contain all sorts of unusual things because it offers to the body one of the means by which these may be got rid of. This is very important practically, because it applies to all kinds of milk, and it means that many babies are injured because they get in their mother's milk, alcohol which those mothers have drunk, perhaps on the advice of ignorant doctors who think that alcohol makes good milk. Also, all sorts of medicines pass in this way, and often the best way to give medicine to a baby is to give it to its mother.

Now, all this applies to cows. If improper things are given to cows as part of their food, the cows are very apt to get rid of them in their milk. Every day in the year many human babies suffer, and not a few are in the long run killed, because they are upset by swallowing cow's milk containing all sorts of oily substances given to the cow, because they appear in the milk, and look like cream. They are not cream, however, but dangerous intruders in the milk.

HOW A DOG IN THE FARMYARD MAY SPOIL THE COW'S MILK

All kinds of excitement and worry also affect the composition of milk, and every careful farmer knows that, if he wants consistently good quality of milk from his cows, he must neither send them to be exhibited at shows, nor must he, for instance, allow a dog to get among them and frighten them. The making of milk is an act partly under the control of the nervous system, and if the nervous system is thrown out of gear, the milk produced may be actually poisonous.

The great difficulty about cow's milk, not only in the case of babies, but also in the case of many grown-up people, is that, when it clots in the stomach, the clot is very dense and thick, and therefore difficult to digest. The calf has far stronger powers of digestion than we have. The remedy is to add to the milk a little soda-water or lime-water, and then we find that the clot which is formed in the stomach is light and loose and flaky.

Cream contains the whole of the fat in milk, but it is a mistake to suppose that that is all. A good deal of the proteid is caught up in the cream too, and thus cream is a very highly concentrated and excellent food, though, of course, not a complete food. There is no form of fat or oil, whether derived from the sheep, or from plants, or from the liver of the cod, or from anywhere else, that can compare with the fat of milk which is contained in cream. It is probable that there would be no such thing as rickets, which means bad teeth and crooked bones, and many worse things, if all children could get enough cream or even enough good milk. Fortunate are those children who get enough good milk, and still more fortunate if they get cream as well.

THE VALUE OF CREAM AND BUTTER AND OF THE CHEAPER OLEOMARGARINE

Failing cream, butter is excellent. That, too, is dear, but much cheaper than cream. It contains about eighty-two parts in a hundred of fat, or, say, twice as much as cream. No other fat is nearly so easily digested, and butter can hardly be too highly praised. If it is cooked, however, the heat is apt to change it partly so that it may upset people. Not only is butter very rich in fat which is very easily digested, but even when very large quantities of it are taken, not so much as one part in two hundred fails to reach the blood.

It is possible to make from animal fats a substance which is very nearly the same as butter. This is oleomargarine. It contains the same proportion of fat as butter, and it is the same fat. In certain other respects it has the advantage of butter, for it keeps better, and cannot so easily become rancid. It is almost as well absorbed as butter. It is, of course, very much cheaper, and the highest English authority says "that there is every reason to wish that the prejudice against it, which is still rather widespread, should quickly disappear, and that it should be welcomed as an admirable and cheap substitute for a rather expensive but necessary food."

HOW CHEESE GIVES STRENGTH TO MUSCLE AND BLOOD AND BRAIN

One other product of milk we must mention, and that is cheese, which, like butter, is made from milk through the action of microbes. We shall see later that microbes have other relations to milk. Cheese is very highly nutritious. A pound of Cheddar cheese represents very nearly the whole of the proteid and most of the fat in a gallon of milk. Beef contains less than half as much nourishment as the same weight of cheese. Of course, cheeses vary considerably in their proportion of food material, and as in the case of fish, and, indeed, of food in general, cost has no relation to value. In the case of food and drink, it is always flavor that is paid for. Careful inquiry leads our best authority to the following conclusion, which, I think, does not need to have any of its words explained: "To the man who wishes to use cheese as a cheap and efficient substitute for meat, say: Buy American (including Canadian) or Cheddar, preferably to any other; for in that way you will be getting by far the most nutriment, in other words, the most muscle and blood and brain, for the money you spend."

Large books, of course, have been written about milk and its products as foods, and this is natural enough, as there is no other food that can compare with it. There is only one other point, however, which we have space for here, and that is the value of milk as a food for the nervous system.

WHY BRAIN-WORKERS AND NERVOUS PEOPLE SHOULD USE PLENTY OF MILK

In this respect milk has no rival. The food that comes nearest to it is eggs, and we can understand the place of these two things as foods for nerves, if we understand that from what is in the egg, aided only by heat and oxygen, the brain of the chicken is actually made; while milk is the food prepared for the development of the brain in all those animals that have the highest brains. The health of the whole body depends upon the brain, which always develops in front of the body, and then helps the body to follow after it. Thus we should expect milk to be specially designed for the benefit of brain-tissue. That is what we find. But brain always retains its importance in the case of human beings, and so, therefore, should milk as a food. For brain-workers, and for nervous persons who suffer from sleeplessness and brain fag and so on, there are no foods like milk and cream; and it may almost be said that milk is the only medicine worth anything in such cases.

All this must be insisted upon because most people have the idea that milk is a food for babies and red meat a proper food for men. But the men who are studying these things—men who want to get the best work out of their minds, or who are training for long-distance races—are beginning to know better. Nothing makes good red blood like white milk, different though their colors be. What makes blood red is iron, and the one food which contains iron in absolutely perfect form for the body to use is milk.

A REALLY IMPORTANT QUESTION THAT SHOULD BE ATTENDED TO

The Japanese have hitherto used very little milk, for Japan as a country is very poor, or was until a few years ago, in animals generally—horses, cattle, sheep, and so on. But the Japanese are aware by their study of modern science that all other foods are second-rate compared with milk. Hitherto there has been very little milk to be had in Japan, and it has been very little used as an article of diet.

Now, not only are the Japanese a rather small and stunted people, but also the proportion of their very small babies that die is enormous. This is not the case, however, with those fed by their mothers. The Japanese are trying to remedy these things, and to strengthen their power as a nation by drinking more milk. We believe in being a strong nation here also, but our legislatures do not pay anything like the attention that they should pay to the really important things. We spend too much time in trying to make good citizens out of boys who did not have enough milk when they were children, boys with bad teeth and crooked bones and narrow chests, and this idea fails, and will always fail. We need good citizens, and we shall always need them, but we need first of all men with healthy bodies—and healthy minds—to make good citizens out of.

THE ANIMAL THAT INVENTED MILK, ON WHICH OUR LIFE DEPENDS

The life and power of all the higher animals, which we call mammals, depends upon milk. It is a pity that we cannot discover exactly what the earliest beginnings of milk were, but we believe it was some branch either of the amphibians or the reptiles that invented this wonderful fluid, and so began the mammalian order. We can at least arrange before our minds all the kinds of mammalian animals now existing, to see whether any general fact is taught us by them. There is such a fact, and a great one.

We find among the lowest mammalian animals, which live in Australia, that milk is of least importance, and is used for the shortest time. But steadily and regularly as we ascend through the mammalian order, we find that the importance of milk increases along the line of real progress; and this means, of course, that the importance of *motherhood* increases.

When we come as far as the man-like apes, we find the longest period, hitherto, during which the young are dependent on milk, if they are to survive at all. If we take the total period during which the life of the young creature depends entirely upon the mother, we find it longer than in any preceding case in the history of the world, and we find also that throughout that time more is demanded of the mother.

THE CHILD IS THE MOST HELPLESS THING IN THE WORLD WITHOUT ITS MOTHER

But though the case of the man-like apes has no parallel before it, it is quite outclassed among ourselves. Here the period of dependence of the young upon their mothers is longer still; the natural period during which the mother nurses her baby has no parallel; Nature makes more demands upon the mother if the child is to survive—that is to say, if the human race is to continue—than she does of any other mother; the human being is at birth more helpless even than the baby ape; and this complete helplessness, for the like of which the whole animal and vegetable world may be searched in vain, is longer continued than in any other case. Now, milk is the outward and visible expression of a greater thing still, which is motherhood; and the lesson we have to learn, which all those who rule nations have yet to learn, is that by the laws of Nature the importance and need of motherhood increase as life ascends, and that upon it depends the destiny of all living races.

ONE OF THE MOST ASTONISHING FACTS THAT MEN KNOW

We have already learnt that at bottom the needs of living matter are everywhere the same. Nothing is more likely than that, if Nature invents a perfect food for a human baby, that food will be very suitable even for living creatures standing at the other extreme of life—the microbes, about which we have already learnt. This is so, and, indeed, all the substances on which microbes can conveniently be grown are foods of one kind and another. None of them is better than milk as a perfect food for microbes in general. Those who cultivate microbes for study, daily avail themselves of this fact, but it has a very serious side.

All milk contains microbes—not as single spies, but in battalions. If the milk is pure and has been carefully prepared, the microbes it contains are innocent. If the milk has been boiled or treated in various ways, whether by heat or by chemicals, the microbes will be dead; but in any case they are there. It is one of the most astonishing of recently discovered facts that a sort of working arrangement exists between the human body and a particular kind of microbe, of which milk is the natural home. This microbe lives on milk sugar, or lactose, and turns it into lactic acid—the acid of sour milk. This change occurs in part in the stomach. This particular microbe lives naturally in our own bodies, and is very useful there. It prevents, when we are well, the growth of many kinds of microbes that would hurt us.

HOW TO GET PURE MILK AND HOW TO KEEP IT PURE

Many people now take sour milk every day, or actually get strains of this microbe from the druggist and add them to milk in order to preserve or to recover their health. This particular microbe is found in the air, and on every solid object wherever cows are. It is to be found in the purest milk, and doubtless has been found in milk for ages past. During that long time we and it seem to have become adapted to each other. Thus, in course of time the purest milk will turn sour unless the good microbes in it have been killed. Such milk is by no means bad for us; many people like it very much.

If cows are properly fed, so that no horrible oils get into the milk, and if they are kept clean and have plenty of fresh air and sunlight, so that they do not suffer from the terrible disease called consumption, then we have the first conditions for good milk. This should be milked by clean hands into clean pails, and the hair and clothes of the milker should be covered with some clothing that has been boiled, and the cow itself should be looked after very carefully. The milk in hot weather should then be cooled immediately, and packed into bottles sealed with a clean seal. No milk should ever be allowed to be exposed to the air; indeed, no food of any kind should be allowed to be exposed, but milk least of all.

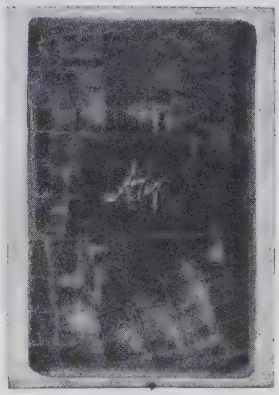
A WICKED THING ABOUT MILK THAT CAN BE STOPPED, AND MUST BE STOPPED

At present, owing to our ignorance and carelessness, milk spreads various forms of tuberculosis everywhere. In the hottest quarter of the year it kills tens of thousands of babies, and it often spreads other diseases, such as typhoid fever, diphtheria, and scarlet fever. These, however, are a mere trifle compared with the enormous massacre yearly caused by milk through carrying tuberculosis from the cow to the human being, and through becoming infected with other evil microbes which kill the babies in our large cities like flies every summer. All this can be stopped any day, and must be stopped. It is certain that, to stop it, milk must become dearer—that is, reckoning in money, not in life, for milk that kills scores of thousands of people every year is dear enough. It almost seems as if the fathers of children would have to smoke one or two fewer cigars every day in order that young America should be fed on pure milk. But, first, we must learn what pure milk is, and how to provide for getting it everywhere.

THE NEXT PART OF THIS IS ON PAGE 2947.

The making of leather from skins of animals is an industry of ever-increasing importance. Here we see the well-equipped laboratory of a modern tannery, where chemists test the solutions used in tanning.

In addition to the skins of animals killed for food, large quantities of dried salted skins come from abroad. They are first of all, as shown, put into pits of water containing chemicals to make them soft.



No man likes to meet a crocodile like this, but nobody fears to carry him in his pocket like this.

NOTHING LIKE LEATHER

CONTINUED FROM 2534

STORED up in our popular proverbs is a vast amount of truth and sense, based upon the experience of men who have lived in all ages of the world's history.

According to one of these proverbs, " there is nothing like leather," and although we do not know who first made that statement, we do know that it is true. There *is* nothing like leather, and, though clever men have worked hard to invent a substitute for leather, they have not been very successful. The demand is ever growing and has always exceeded the supply. It comes from the skins of animals, and every bit of leather in the world was once alive.

Leather-dressing was one of the most important trades among the ancient Egyptians, and at Thebes, in the days of Egypt's glory, a special quarter of the city was set apart for the tanners. So great was the demand for leather that Egypt itself could not provide enough skins. One of the forms of tribute exacted from conquered nations was a number of skins, to be delivered every year for the making of leather by the skilled Egyptian tanners. In our museums we can see to-day splendidly preserved leather straps and belts used for binding round the mummies of men who lived far back in the days of Solomon. The mummies themselves, as they were carried to burial, were often covered with a pall or canopy of soft leather, dyed a delicate blue. The Egyptians used leather for making sandals, braces, belts, bags, shields, harness, sails, cushions, and chair-seats. From them the Israelites learnt the art of tanning, and, although the word leather occurs in the Bible only twice, there are many references to skins, which clearly mean leather.

The Greeks and Romans made leather, and indeed it is difficult to find any nation, ancient or modern, civilized or uncivilized, to whom leather has not been known. The most extraordinary things have been made of it. The Romans at one time had coins of leather, and some of the early cannon were made of leather.

In the making of leather from the rough skins of animals different processes are used, but they are all based upon the same principle, and are very similar. It is curious to know that the methods used by the Egyptians three thousand years ago are very much like methods still in use. Whereas in most other industries modern science and invention have completely transformed the processes of manufacture, and made it possible to do in a tenth of the time, and with a better result, work that was formerly done by hand, in the tanning of hides and skins it has not been possible to hasten and improve the process so much.

For a great many years inventors puzzled over the difficulties of making machines that could distinguish between the different weights, thicknesses and sizes of the skins, no two of which are exactly alike. To-day, there is still much to do, but there are wonderful machines for many of the processes. Some are fitted with blades for shaving off the hair from the hides; there are machines to split the skins, and elastic and movable tables that can adjust the leather to the pressure of the tools working over its surface.

The animals whose skins make the best leather are those living in hilly countries, where there are great changes in temperature. The skins of the big cattle that we see in shows are of very little use for leather. Young animals provide better leather than old ones.

Before they can be made into leather the skins are often treated with lime, and a curious fact is that the lime used must have been used before for other skins. It was once thought that the lime itself, by some chemical action, loosened the hair. As a matter of fact, fresh lime tightens the hair in the skin. The old lime, owing to its contact with former skins, is full of bacteria, the tiny creatures that we can see only through a very powerful microscope, and these bacteria make their way down into the epidermis, destroying the roots of the hairs so that they come away easily. This fact explains the why and wherefore of a process that has been known and used for thousands of years.

THE ANIMALS FROM WHICH WE GET LEATHER

The skin of any animal can be tanned but the main sources of our leather supply are oxen, sheep, goats, and pigs. A good deal of leather is now made from the skins of seals—not fur seals, but the seals caught in the Atlantic Ocean. The skins of crocodiles, lizards, snakes, and frogs are tanned for making bags, pocket-book covers, and letter-cases. They are too horny for most other purposes.

Horse-skin provides an excellent leather, much used for the boots of sailors and fishermen, because it is exceptionally waterproof. Porpoise leather, really made from the white whale, is very strong. Elephant, rhinoceros, and hippopotamus hides make a very heavy, thick leather. The skins of sharks, buffaloes, antelopes, deer, kangaroos, wallabies, donkeys, and chamois are all tanned, but the supply is so small that it is of little commercial importance.

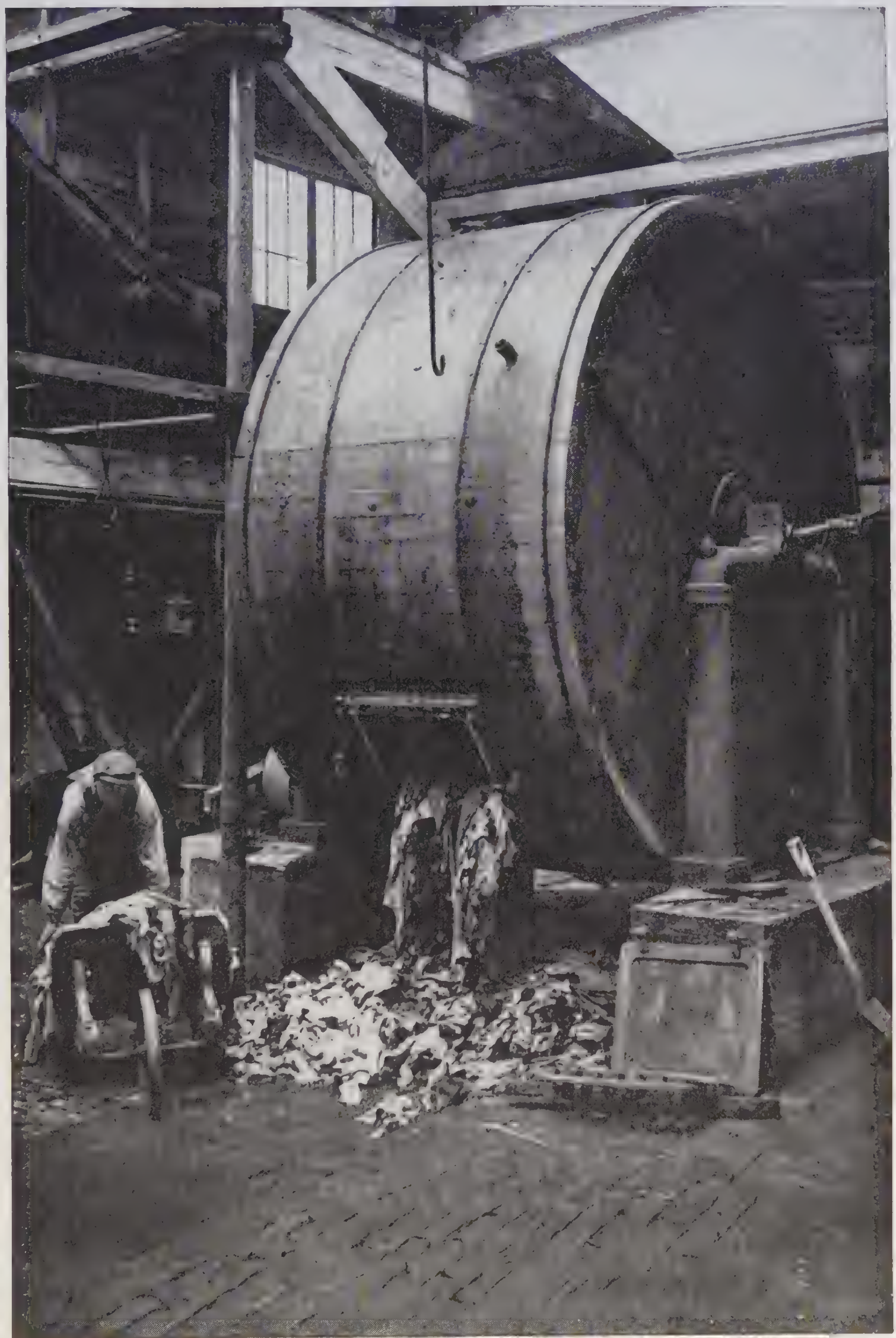
And this reminds us that the world is less and less able to get enough leather for its needs. Leather is what is known as a by-product—that is to say, the animals are reared and killed, not for their skins, but for their flesh; and as the skins happen to be there, they are used for making leather. But as people are now eating less meat than they used to and it would never pay to rear animals simply for their skins, the supply of leather is growing smaller.

During the last few years the price of some leathers has doubled, and other kinds cost several times as much as they formerly did. The uses of leather have increased also until we count them in hundreds. Leather is used for the great belts that drive big machinery, and for the small buttons on a boy's coat; it is used for upholstering a motor-car or a carriage, and for making a purse; many people of other lands who used to wear wicker sandals or wooden sabots now wear leather boots and shoes. In the Great War an enormous quantity of leather was used for boots, leggings, and other articles. So that far more leather is being asked for than can be produced.

As yet artificial leather cannot compete with the real hides, although inventors have made substitutes which are used not only for book-binding, upholstering motor-cars, and making bags and purses, but also even for the soles of shoes. The Japanese, who are great leather users, and whose ornamental leather work is very beautiful, have an imitation made from compressed layers of paper spread with a mixture of rice paste and lamp black. A Belgian invention consists of heavy cotton cloth impregnated with substances containing tannin and albumen. Several German substitutes are in use, and a good many American ones.

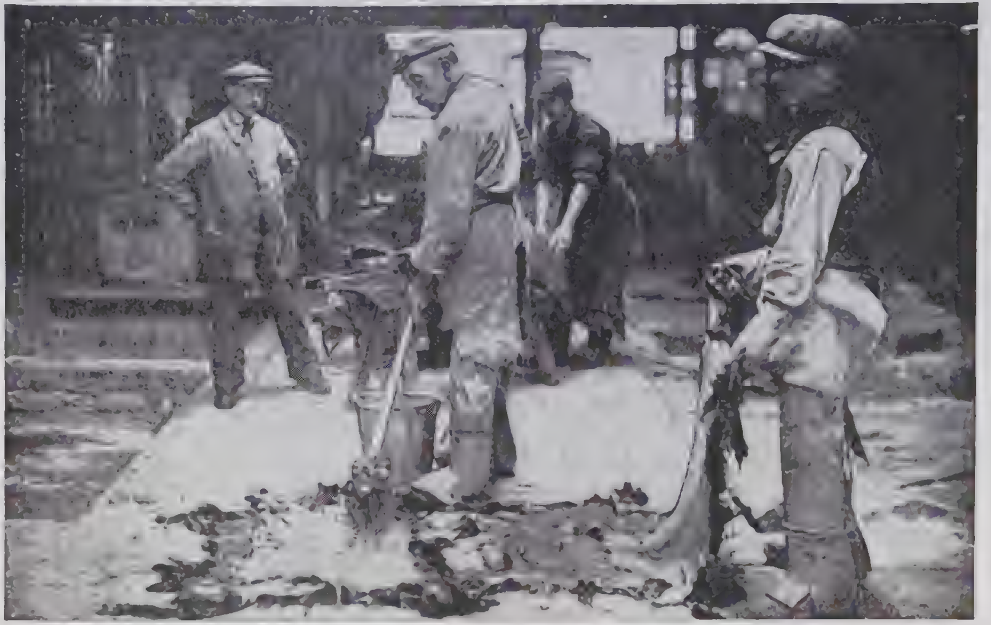
CONTINUED ON PAGE 3112.

THE BIG DRUM AT THE LEATHER WORKS

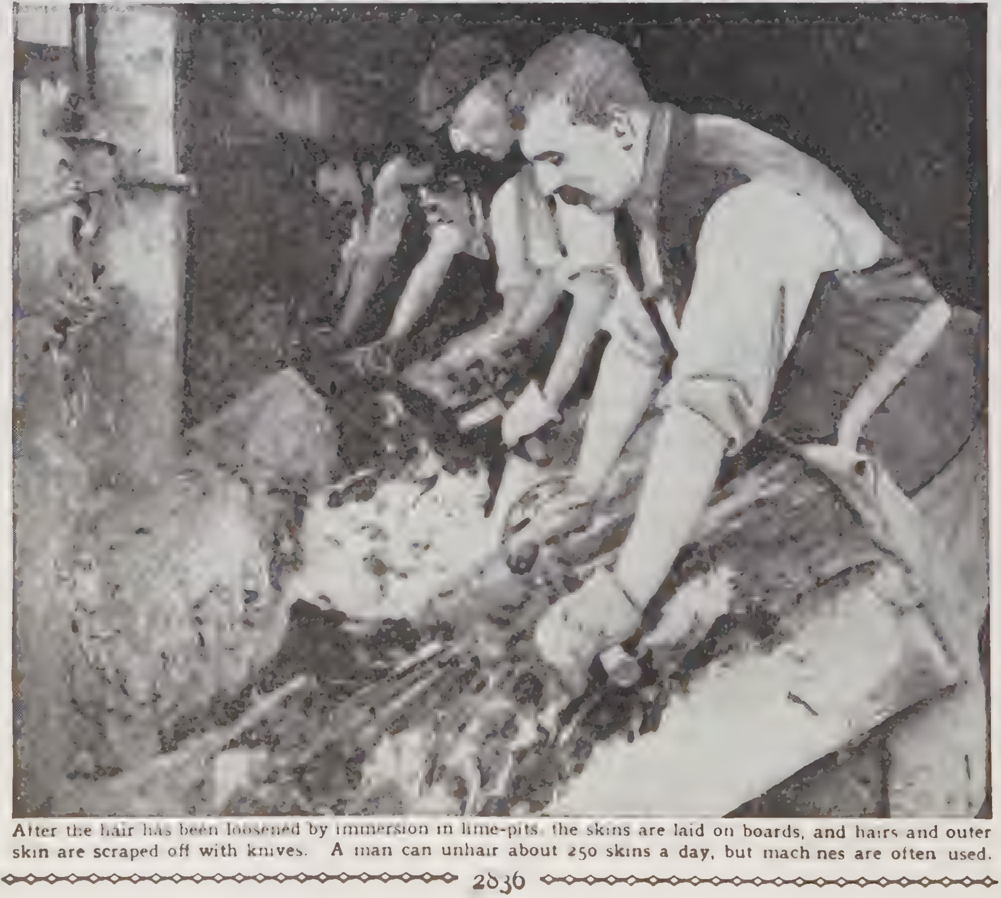


After coming from the water-pits where they have been soaked, sometimes for days, the skins are put into a revolving drum, like that in picture, which contains chemicals, where they are still further softened.

PREPARING THE SURFACE OF THE SKINS



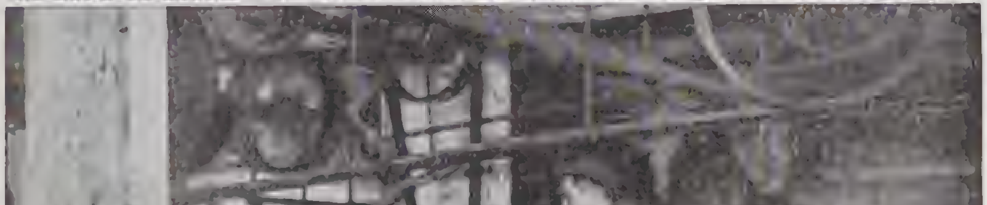
It is necessary to remove the hair from skins before they can be tanned, and one way is to lay them out on the ground, cover them with a mixture of lime, and then fold up and place them in pits for a time.



After the hair has been loosened by immersion in lime-pits, the skins are laid on boards, and hairs and outer skin are scraped off with knives. A man can unhair about 250 skins a day, but machines are often used.

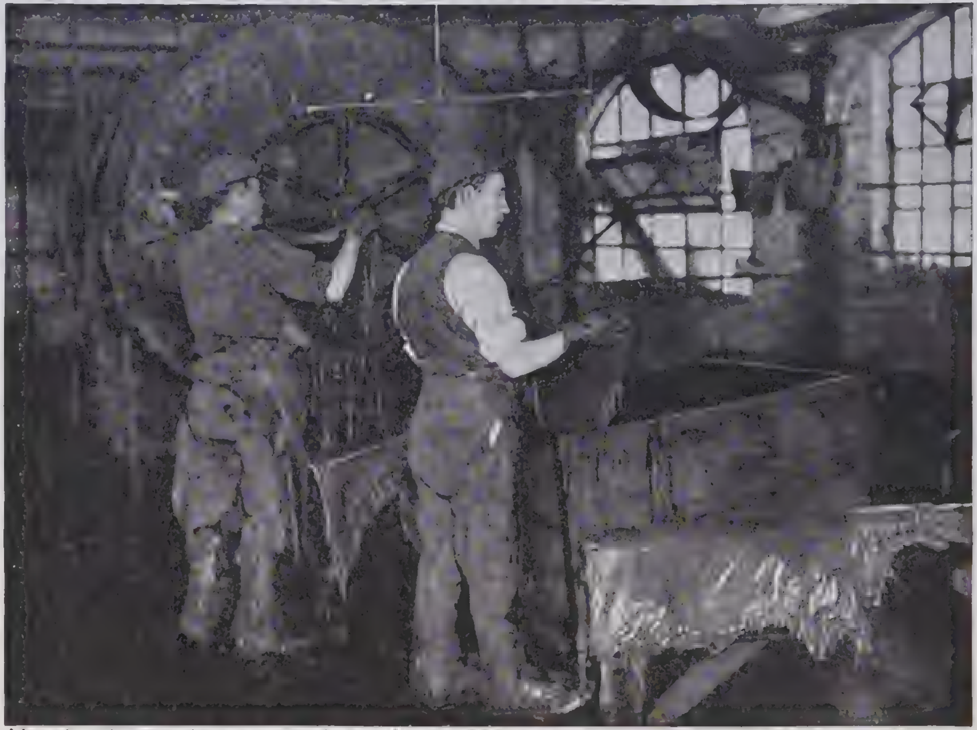
THE HAIR OF WHICH CLOTHES ARE MADE

The hair that is scraped off goat-skins is collected and passed through this machine, which dries it. It is then sent to the factories to be made into cloth for cheap clothes. Good goat-hair realizes a good price.

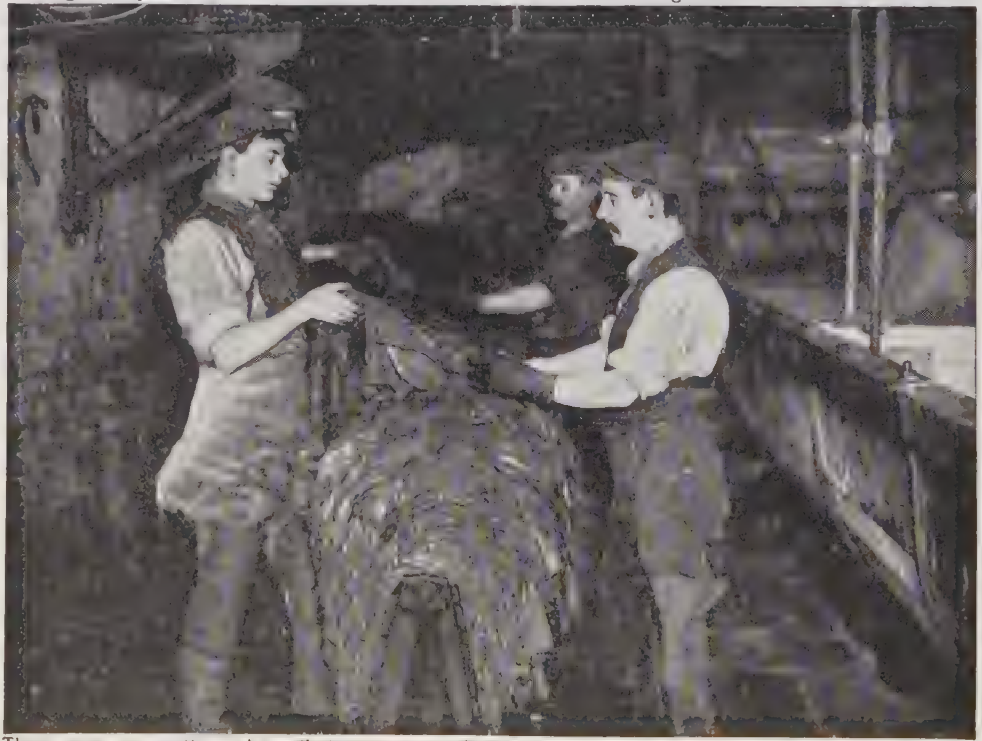


The skins now pass through several processes of cleaning before being tanned. The machine in this picture takes all dirt out of the skin, and removes any hairs that remain. It cleans about 3,000 skins a day.

HOW THE SKINS ARE TANNED INTO LEATHER



After cleansing, the skins are ready for tanning, in which processes vary. Pictures on this page show chrome tanning. It produces water-resistant leather. Here skins are being taken from a drum of acid.



These men are putting skins that came out of the drum into a second tanning bath. It will be seen that most of the men wear gloves. This is for protection, as the acid causes serious wounds.

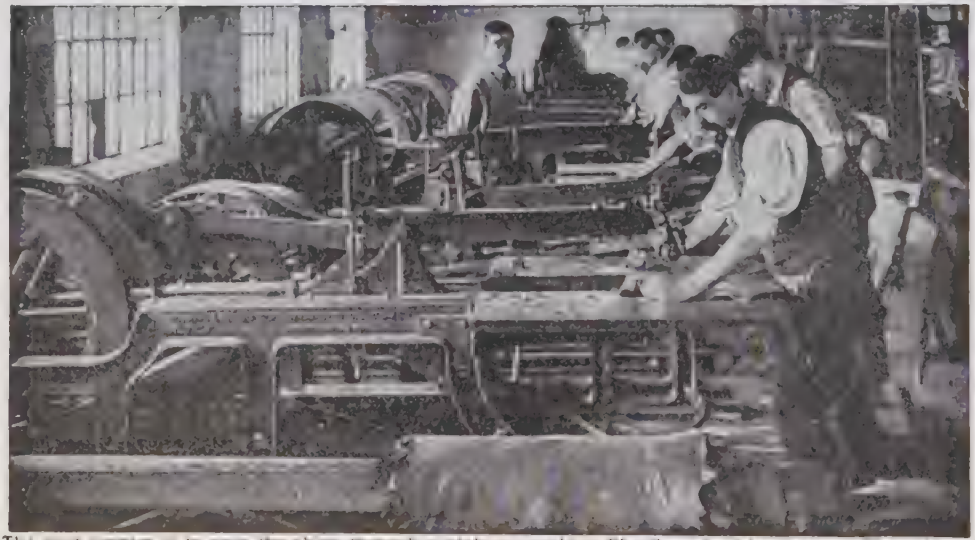
SHAVING THE SKINS TO ONE THICKNESS

After being tanned, each skin is made of the same thickness; this machine shaves off all inequalities, or if the skins are thick enough divides them into two. The machine shaves nearly 1,000 skins a day.

Other processes follow, and the skins are then oiled. This helps to make them waterproof. They are next placed in ovens. In many of the processes no satisfactory machinery has yet been invented.

PREPARING TO GLAZE THE LEATHER

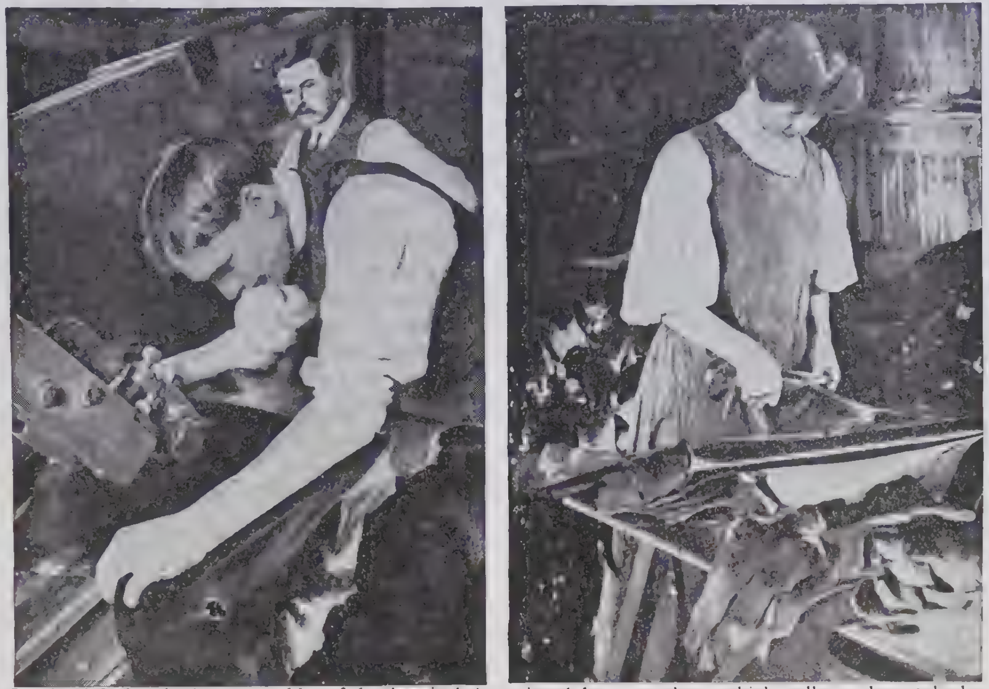
The skins, having been dried, are damped again by being packed in wet sawdust. These youths are very quick at the work, and can pack away as many as several thousand skins a day in the sawdust baths.



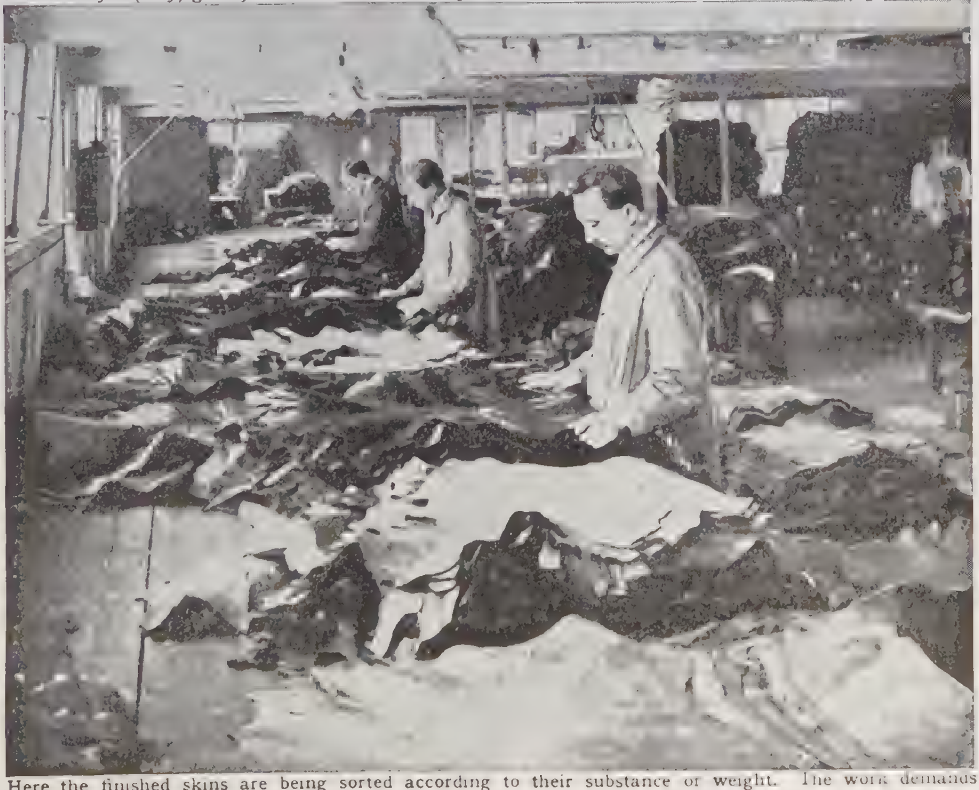
The next process is to pass the skins through a staking machine like those in this picture. The skins go through the machine twice, and, as a result, are rendered soft and pliable, with the stretch taken out.

The leather is dyed, and before it can be glazed it must have one or more coats of seasoning mixture put on to make it take the glaze, and that is what these girls are doing. Women do this better than men.

"THE FIRST SHINE ON A PAIR OF BOOTS"

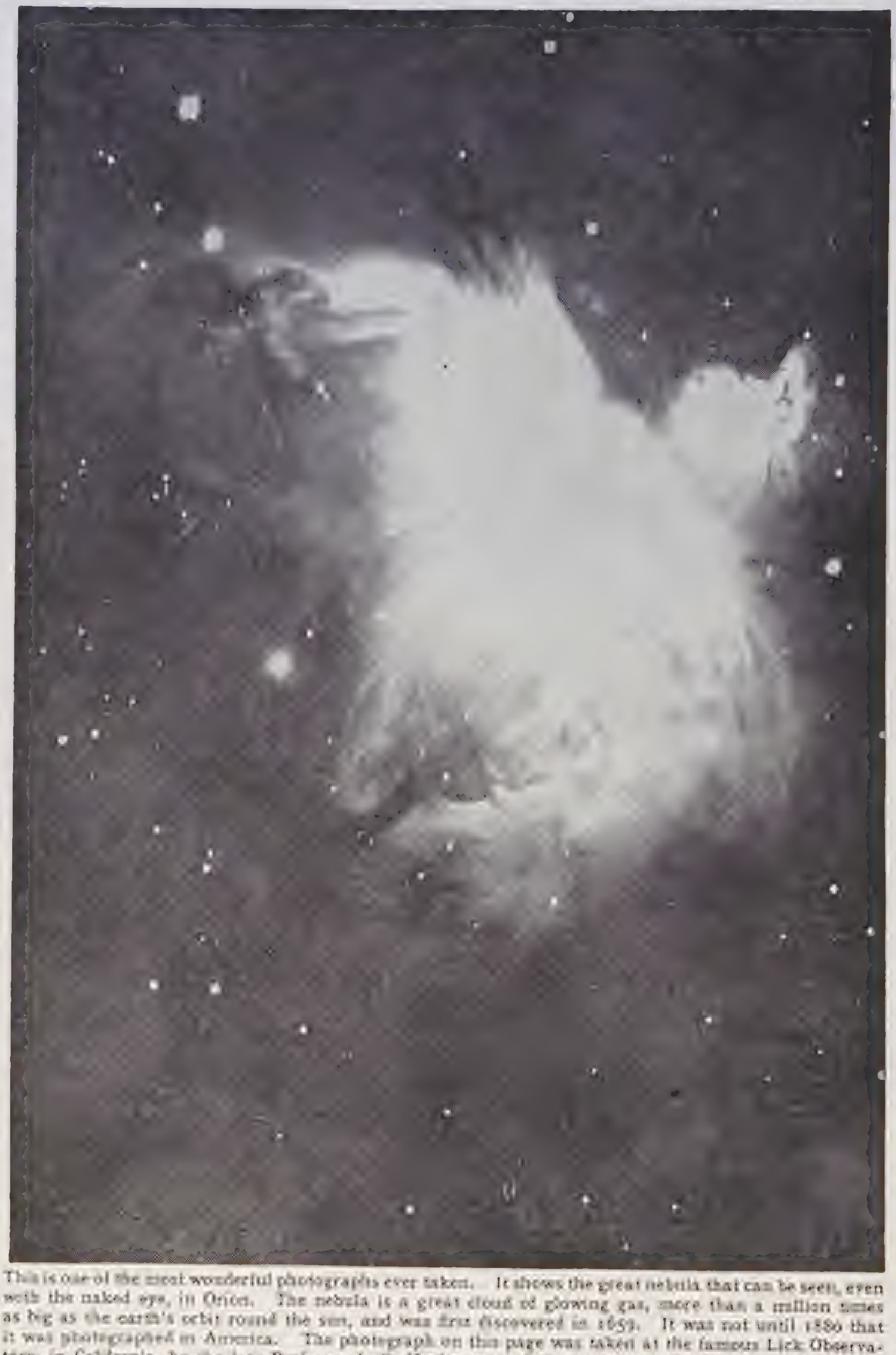


In the left-hand picture a skin of leather is being glazed by a machine which rolls a glass cylinder over it very rapidly, giving "the first shine on a pair of boots." On the right the skin is being trimmed.

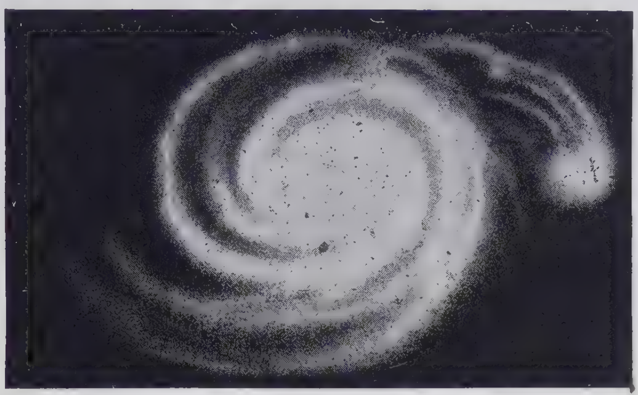


Here the finished skins are being sorted according to their substance or weight. The work demands skill and knowledge of leather, and every man who attempts it must be a thorough expert at his trade.

A MIGHTY CLOUD OF GLOWING GAS



This is one of the most wonderful photographs ever taken. It shows the great nebula that can be seen, even with the naked eye, in Orion. The nebula is a great cloud of glowing gas, more than a million times as big as the earth's orbit round the sun, and was first discovered in 1659. It was not until 1880 that it was photographed in America. The photograph on this page was taken at the famous Lick Observatory, in California, by the late Professor J. E. Keeler, one of the greatest authorities on nebulæ, and shows the nebula as it appears to astronomers through the best telescopes. By means of such photographs future generations will be able to see whether the nebulæ change at all in the course of centuries.



Over half a million nebulæ, or light-clouds, have been discovered, and at least half of these have a spiral form like the one seen here. As this great mass of glowing gas whirls round, we can see a part being thrown off, and some think this is the birth of a world like ours, with its moon.

THE MAKING OF OTHER WORLDS

CONTINUED FROM 2741

SCATTERED here and there among the stars we find cloudlike patches which are called nebulæ. The word nebula means a cloud. These nebulæ are of enormous size, occupying vastly more space than the biggest star. On the other hand, they are composed of matter which is in a very rarefied, or thin, condition, so that the mass of a nebula is very small compared with the enormous space it fills. Some idea of the size of nebulæ can be obtained from these words of Professor Newcomb: "A nebula only as large as our solar system would probably be invisible in the most powerful telescope, and could never be impressed even on the most delicate photograph of the sky unless above the ordinary brightness. Those that we know have probably hundreds or thousands of times the extent of our whole solar system."

It was not a great while ago that nebulæ were thought to be very few, for, indeed, only a few were known. If they were really very few in number. it would be difficult for us to assign to them the great part we do in the evolution of the stars. But in recent years we have begun to learn that the number of nebulæ is really very great. At the beginning of the present century it was recognized that their number ran into tens of thousands, and later it was stated that we were acquainted with 120,000 nebulæ. But the great telescope at the Lick Observatory in California has added largely to the number of nebulæ that we know, and we can positively state that the number of nebulæ is well over half a million. Doubtless, this is only a fraction of the number which will be known in fifty years or so, but it is very important for us to have, at any rate, some idea of the great number of the nebulæ, as the theory that they are stages in the history of stars evidently demands that their number should be great, as we now know it is.

And next we come to a very serious question. Suppose that there were a cluster of stars at a great distance from the earth, is it not probable that they would appear to us like a bright cloud of matter in the sky? The answer is that this would have to be so. Now, we know that there are such things as clusters of stars, and we can assign no limits to the distance of such clusters. May it not be, then, that what we call nebulæ are really nothing at all but star clusters seen at such a distance that the individual stars cannot be distinguished from one another?

In the middle of last century Lord Rosse built a great telescope—the greatest then known—which was so powerful as to show that many appearances in the sky which had been called nebulæ were groups of stars. Their cloudy appearance was the result of their distance. Very naturally, astronomers were strongly inclined to believe that if only we had large enough telescopes all the nebulæ would be resolved into star clusters. Now, here is a case where it might have been thought that proof of what is really the truth could never be obtained. However large your telescope, you could never be certain that what looked like a nebula through it would not be seen as a star cluster through a still larger telescope.

But here again the marvelous spectroscope, about which we learned on page 2738, comes to our aid. It has proved, beyond any question, that there are real nebulæ in the skies, consisting of gas and nothing else; that they are clouds of glowing gas, and not clusters of solid stars.

WHAT WE LEARN FROM THE LIGHT GIVEN OFF BY GLOWING GAS

The evidence really depends upon what we know about the kinds of spectra which we can study on the earth. We know that when we examine the light given out by a glowing gas, which is nothing but gas, it does not consist of a continuous band of color, like the spectrum of sunlight, but of a larger or smaller number of bright lines with completely dark spaces between them. Thus we distinguish spectra as of two kinds, which are known as *continuous* and *discontinuous*. A continuous spectrum is a band of color, and is produced by the light given off from anything which is not wholly a gas; a discontinuous spectrum consists of separate bright lines, and always means that the substance producing it is purely a gas. Now, it was discovered, especially by the English astronomer Sir William Huggins, that the spectra of many nebulæ are discontinuous, proving beyond question that they are really nebulæ, or clouds of gas, and nothing else. As we have already learned, the theory that nebulæ have something to do with the making of suns or stars was first made entirely with reference to our own solar system. The idea first occurred, in his youth, to the great German thinker Kant, and it was afterwards worked out by a French mathematician called Laplace. He supposed that the solar system was made from a nebula shaped like a great globe, or sphere. He thought that this globe would in time become somewhat flattened as it spun, that rings would be detached from the outside of it and form planets.

THE SHAPE OF THE GREAT CLOUD FROM WHICH THE WORLD WAS MADE

This theory is not now maintained by anyone. Neither the solar system nor any of the systems of which other suns are the centres could be formed in this way. Rings would not be broken off in the fashion supposed, and if they were, they could not condense into planets. There are many other objections which, taken together, are quite fatal to this theory; not the least of them is that among all the nebulæ we have discovered there is not a single one which is really a ring, that would answer at all to Laplace's idea. Even the beautiful nebula in Lyra is known not to be a ring, but something else.

Laplace knew nothing whatever of any kind of nebula but a globular one, but we are in a very different position today. When Lord Rosse made his great telescope, he not only discovered with its aid that many so-called nebulæ are not really nebulæ, but he made the great discovery of what are called *spiral nebulæ.* We all know what a spiral staircase is, but we must not think of a spiral nebula as having that shape. It is a flat thing, unlike the staircase. On page 2843 we can see a photograph of a typical spiral nebula, which is, perhaps, more like a flaming "Catherine wheel" than anything else.

THE SILENT MOVING OF THE HEAVENS WHILE EMPIRES RISE AND FALL

This discovery was not at first believed; a Frenchman suggested that probably a spiral scratch had been made on one of the glasses of the telescope while cleaning it, and that this was all that Lord Rosse had seen. But we know now that spiral nebulæ are realities, and that they are very numerous. *At least one-half of all the nebulæ we know are spiral,* and the better photographs we take, the more do we find evidence of spiral structure in nebulæ which had not previously been thought to be spiral.

Now, it is perfectly evident that this particular shape of so many nebulæ is not a matter of chance. All sorts of things are possible in the sky, and if we knew only one spiral nebula, or fifty or a hundred, we might put down this particular shape to the chance of perhaps some peculiar kind of collisions in the sky. But when we find that more than a half of all the nebulæ we know are spiral, it is quite evident that the spiral shape must represent a stage in the history of worlds.

When we study the photographs of some spiral nebulæ, we see appearances which suggest that suns or stars are being formed in them, as if the matter composing the nebula were condensing in places. There can be little doubt that such nebulæ as these are indeed forming star clusters, similar to those which we see in other parts of the sky, and those star clusters represent later stages in the history of spiral nebulæ. In the case of a system like ours, where there is only one star and not a cluster, we must suppose that the original nebula was a very much simpler and smaller thing than the spiral nebulæ we see in the sky. How many millions of comparatively small nebulæ there may be in the sky—too faint for us to see or even to photograph—no one can say. It is probable that those we see are only the giant specimens which are going to make star clusters, and not the little ones which are going to make individual stars like our sun.

In the study of the spiral nebulæ the spectroscope again comes to our aid. It has been said that they look as if they were turning solid in parts—as if here and there stars were being formed out of the gaseous matter. The evidence of the spectroscope confirms this view, for it shows that the spectra of spiral nebulæ are not wholly discontinuous, but are just such as we should expect from a mixture of partly gaseous and partly solidifying matter.

If a spiral nebula is to condense into stars, or if a very tiny spiral nebula, such as we cannot see, is to condense down into something like the solar system, we must suppose that the nebula is spinning. It would be very satisfactory if we could watch a spiral nebula, and see it spin before our eyes. This cannot be, however. We must remember that we are looking at objects so large that to add our solar system to them over and over again would make no apparent difference. We see no spinning. Nevertheless, there is every reason to suppose that these nebulæ are spinning. It is our business to record as accurately and in as much detail as possible what we see, and so begin to provide the evidence which will enable future generations of astronomers to prove that these nebulæ are spinning. If we suppose that they are spinning, it is natural and easy to understand how separate stars or planets may be formed by being detached from the spiral branches of the nebula, and there are not a few photographs of nebulæ in which we seem to see this happening, though it is impossible to get proof in lives so short as ours. One of the best authorities says:

This is the nebula in the southern constellation of Argo, and it is supposed that in the beginning our solar system was in this form of a vast volume of gas.

"The heavens show us thousands of spiral nebulæ which are evidently in a state of rotation round a central nucleus, but which will probably take ages before they have finally consolidated into suns and solar systems. But ages are but moments in the evolution of the stars, and we need not expect to find much evidence of rotation and consolidation during the brief span of human history. Empires rise and fall, dynasties are founded and dissolved, but the heavens move on in their silent course, and the human race will probably have perished before the universe has reached its final destiny."

But I do not know that we have any right to use such words as "final destiny." It may be that there is no end to the drama of Nature. At any rate, we are beginning to find evidence that there may be new beginnings, even when the end seems to have come.

THE CHANGES THAT MAY GO ON FROM AGE TO AGE IN THE SKIES

When we were studying the stars, we traced their history through various stages of brightness until at last they became dark, cold, "dead suns." That seems to be an end, and it might be supposed that all the stars are running towards this end, so that one day there will be a universe of nothing but dead suns. But, on the other hand, we see in the heavens examples of all the earlier stages in star history, including even these hundreds of thousands of nebulæ.

There are, then, new beginnings being made, and the question is, How? Can we suppose that anything could happen to a cold, dark star which could transform it into a nebula? If this can be supposed, then our theory of star evolution begins to be complete, for instead of having a process running along a line, we shall see that there is a process running in a circle, and we may suppose that this circle, or cycle, represents what happens from age to age in the skies, and that the different kinds of object we see represent different stages of it in different cases.

DO WORLDS BEGIN IN GREAT COLLISIONS IN THE SKY?

The stars, we know, both bright and dark, are not fixed, but moving. We have clear proof also that gravitation is at work among the stars. If, then, they all have an attraction for one another according to their mass and distance from each other, and if these distances are constantly changing as they move, there is the possibility of collision.

It is more than possible; it is exceedingly probable. If a dark star and a bright one, or two dark stars, ran into one another, or merely grazed each other, what should we expect to happen? Their motion would be largely transformed by friction into heat, just as when you rub your hands together. If this heat were intense enough, it would convert all the matter of the stars into a gaseous form again; in other words, such a collision might *create a nebula.* It is natural to ask whether we have ever seen such a thing happen. It may be that we have, or, at any rate, that some of the cases where new stars have blazed out suddenly are due to some kind of collision in the sky.

Recently various astronomers have shown that if two dark stars grazed each other, or even approached closely to each other, without actually touching, there would be not only the production of great heat, but also tidal effects. These tides, it is believed, would cause explosions and eruptions of gaseous matter, and it can be proved that the matter ejected would take the spiral form. In theory, we should expect to find that in such a case there would be two spiral branches produced at directly opposite points, like tides upon the earth.

THE WONDER OF THE LIFE-HISTORY OF A STAR IN THE HEAVENS

Now, it is very remarkable that when we study the spiral nebulæ we find that they usually do have two spirals, and that in almost every case these come out from the central nucleus of the nebula at points directly opposite to each other.

Here, then, is further evidence that celestial collisions may be responsible for the creation of nebulæ from stars that have run their course. These immensely interesting ideas are comparatively quite new, and we are only at the beginning of the study of them. There is no doubt that a great part of the astronomy of the future will be devoted to the study of the spiral nebulæ.

There are many nebulæ which do not seem to be spiral at all, and many in which only traces of a spiral structure can be detected. It may very well be that nebulæ which have no spiral structure are sometimes formed by actual headlong collision between stars, dark or bright; and it is important to inquire whether such nebulæ in the course of time would tend to take a spiral form. We believe that they would. Given a shapeless nebula in which movement was going on, however irregular, it seems to be certain that in the course of time such a body would slowly begin to assume a spiral form. On the other hand, a nebula might be spiral from the first if made as a consequence of a "grazing collision."

A NEBULA GREATER THAN MANY MILLIONS OF EARTHS

It is probable that there are dark nebulæ. It may be that a dark nebula as it shrinks gets warm and bright; that the next stage is the taking of a spiral form; then the formation of star systems or of solar systems, such as ours; and so through various stages of brightness and temperature to darkness. In the course of this long history there is probably a stage of rise in temperature, and then a stage of fall in temperature. There seems to be no doubt that our sun is in the second of these two stages.

We ought to know where to find the finest of the nebulæ. When we were describing the principal constellations, we learnt about the great nebula in Orion, which was discovered a little more than 250 years ago. We find that photographs of this amazing object show us six large stars lying in a nebula, which scatters away into space to a stupendous distance around them. When we look farther we find that these stars are only a small number of the whole, though we do not know how many of the hundreds of stars which can be seen here are really part of the nebula. We have real evidence in this particular case that slow changes are going on. Some idea of the size of the nebula may be obtained from the comparison made by Sir Robert Ball. If we could imagine a great globe bounded by the earth's path round the sun, it is certain that a million such globes could be easily engulfed in the great Orion nebula. It contains an enormous quantity of hydrogen.

THE ETHER THAT IS EVERYWHERE, AND THAT NO MAN UNDERSTANDS

We ought also to know the great nebula in the constellation Andromeda, which is not far from Cassiopeia. This splendid object is really a true spiral. So, also, is the so-called "ring nebula" in Lyra. The nebula in the southern constellation, Argo, is not spiral. Here we must end our brief study of astronomy, the oldest and most magnificent of all the sciences. We are really only at the beginning of the "new astronomy" created by the spectroscope, and no science has a greater future before it.

But a word or two must be said in conclusion regarding the greatest and most urgent of the problems which the astronomy of the future has to solve. This centres round the word "ether." The ether is certainly something as real as this paper, though it is not ordinary matter, but very different, and is believed to be absolutely everywhere. The vast "empty" spaces between the stars are all completely filled with it. It is the medium which conveys their light from one to another across billions of miles, just as it conveys the light a few inches from this page to our eyes. It is here, where the air is, and it fills the spaces between the heavenly bodies, where there is no air. It is the medium by and through which universal gravitation exerts its power.

THE RIDDLE OF THE ETHER THAT MEN EVERYWHERE ARE TRYING TO ANSWER

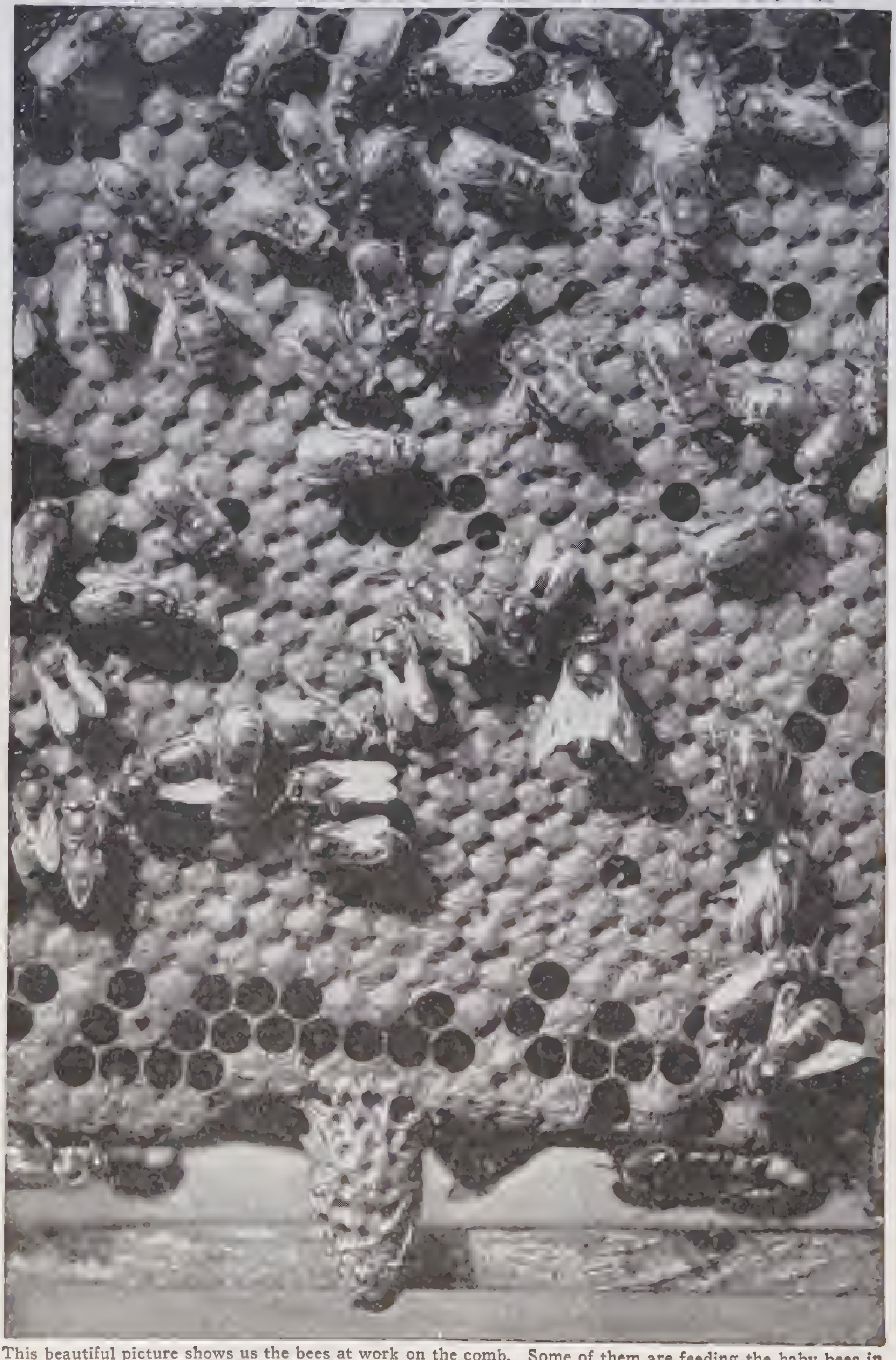
More than this, we now believe that what we call ordinary matter, of which our bodies, earth and sun, stars, nebulæ, and comet are composed, is really a product of the ether; and probably that after an atom has run its course, whether here or a billion miles away, it is resolved again into the infinite ocean of ether, like a melting iceberg in the sea from which it was made. As yet we know very little about the ether, and even less about the relations that exist between it and ordinary matter. We do not know whether the earth or any heavenly bodies in their movement are at all retarded by the ether, though, if they are so retarded, the influence of the ether is too slight for us to detect.

All over the world astronomers, and not only astronomers but also students of light and electricity and chemistry, are working at the riddle of the ether, for it comes into every scientific question, and is the unanswered problem at the bottom of everything. Yet there is reason to hope that the problem is not insoluble, and its solution will be the deepest scientific discovery of all time.

We shall next have to return to more homely matters, and learn the chief facts of geology, which is the science that deals with the history of the surface of the one heavenly body which we can study at close quarters—our own earth.

THE NEXT PART OF THIS IS ON PAGE 2913.

WHAT WE MIGHT SEE IN THE HIVE



This beautiful picture shows us the bees at work on the comb. Some of them are feeding the baby bees in the cells, some of them filling cells with honey, some of them packing in pollen or "bee-bread." Down in front there are some empty cells. Perhaps an egg is in the bottom of each. The irregular pouch hanging from the bottom is a queen cell, in which a baby queen is living, getting ready to lay thousands of eggs. When she is ready to come out the old queen may lead off a swarm.

THE BEES AND WASPS

CONTINUED FROM 2709

THE insect world is more crowded with life than any other division of Nature—the sea, of course, excepted. We can never hope to count the whole number of living things in the sea, or of the tiny living things on land, but we know that the insect *species* are more numerous than the species of all the rest of the animal world.

Nobody has yet been able to classify them all; nobody ever will—the number is so vast. Science counts about 150,000 different species of beetles, and over 50,000 different moths and butterflies. Some authorities put down the number of species of insects at 5,000,000; but another student, going more thoroughly into the question, believes that in the future our scientists may classify 10,000,000 species.

Many insects are harmful to us, but others are very valuable. In spite of all that we may do with deadly powders and liquids in washing and spraying trees and plants and crops, we should be overrun with harmful insects were it not for the work of other insects. Many species of insects prey upon other insects. There are 25,000 species of ichneumon flies alone which prey upon deadly enemies of the gardener. All that they do is to follow their natural instinct; they assist us without intending to do so, without knowing anything of their value in saving the crops. Other insects help to make outdoor life more beautiful by the splendor of their appearance. The bodies of some yield valuable medicine and dyes; others form the food of birds. But there is a more important work than this that insects do for us. Some carry the pollen from flower to flower, so making plants and trees fertile and able to yield their harvest of flowers and fruit. Without the insects many of our flowers would die out, and many trees would fail to yield perfect fruit. Some, again, act as scavengers, and perform highly important work in consuming offensive material which might be dangerous to health.

At the head of the insect family come the bees, wasps, and ants. Their skill is so remarkable, their organization so extraordinary, that there is a danger of our giving them credit for too much wonderful knowledge, and of our ascribing to very high intelligence, works and ways which proceed from that governing influence in animal life which we call instinct. But we can leave out of account the difficult problem as to where instinct ends and intelligence begins. We are tempted to believe that bees must think and reason; we know that a

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sudden, unexpected event will cause them to make fresh plans, just as human beings would.

The story of the bees is like a fairy tale. They are creatures of the sunlight; their food is the sweet nectar and nourishing pollen of the flowers, just the sort of diet that fairies ought to have. They have willing workers; they have their lazy idlers. They commit murder upon a great scale every year. It is not murder to them; it is only the carrying out of a necessary law of the city in which they live. They are wonderful architects and builders; they have the gift of finding their way about in the open air back to their homes, which birds possess. They have splendid sight, keen sense of taste and smell, and they love each other's company.

We must not make the mistake, however, of thinking that all bees live in swarms, like the honey-bee. There are carpenter bees, which bore tunnels in the pith of canes or in the wood of dead trees, in fences or gate posts. Leaf-cutting bees cut dainty pieces from tender young leaves to line their tunnels in plant stems. Some bees burrow tunnels in the ground. The mason bees build little cells of sand or clay and tiny pebbles. The potter bees make little cells of earth which they fasten to the stem of a plant.

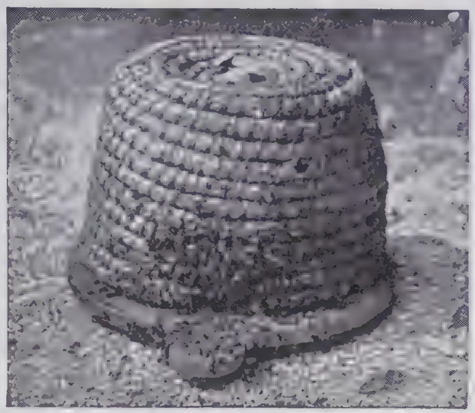
These bees are all solitary; that is, each bee works alone for her own family. Many bees make solitary cells, and each bee lives a solitary life. In some families, each bee makes several cells close together, in others large numbers of bees burrow or build in colonies. Nearly all these bees prepare food for their children from the nectar and pollen of flowers. The nectar is made into honey; honey and pollen is packed into a cell; the mother bee lays an egg in the cell, covers it up and goes away, never to see the young bee for which she has taken so much pains. Some bees, however, take no pains to prepare either food or cradle for their children. They simply go to the houses built by a mason bee or a carpenter bee, and there lay their eggs. Sometimes there is enough food for both grubs, but oftentimes the young parasite grub comes from its cell first, eats up all the food in the house, and leaves the lawful owner to perish from hunger.

Then there are the bumblebees, heavy bees, with a deep bass voice, that go droning home in the hot sunshine of the summer afternoons, heavily laden with nectar or pollen to be made into food for the baby bees. Probably many of you know where a nest of bumblebees can be found. Perhaps some of you have stolen the honey and have gone home suffering from the stings of the angry bees, and the sting is much worse than the sting of the honey-bee. If you do not know where a bumblebee's nest is, you may be able to track one to its home. You must not expect, however, to find it easily, for the bumblebees make their nest underground and the entrance is often hidden by the grass. Unlike the mason and carpenter bees, however, the bumblebees live in societies, and the young bees are fed with care. The lives of all these bees make a very interesting study. Perhaps in your vacation you may have an opportunity of watching some of them and learning their habits and ways of working. You would find it a most fascinating game.

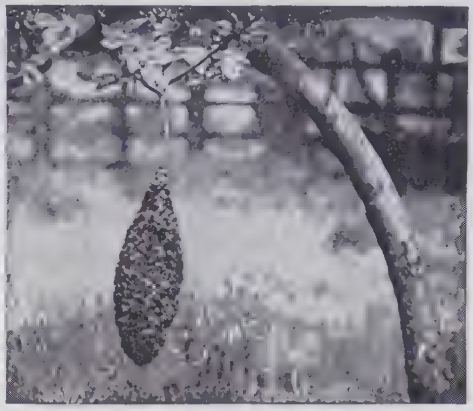
In this story, however, we are chiefly concerned with the work of the honey-bee, and now we are going to tell you something that may surprise some of you. Hive bees have not, as some of us have thought, lived here from time immemorial. As a matter of fact they were brought here from Europe. There were plenty of other bees—mason bees, carpenter bees, bumblebees and all the rest of them—in America when the white man came, but not a single hive bee. But, some one says, what of the stories we have read of wild honey, and of bears climbing hollow trees to eat the honey stored there? The stories are all quite true, but the wild bees are all descended from swarms that escaped, and were lost, a thing that may quite easily happen.

HOW THE BEES LEAVE THEIR HOME AND BUILD WITHOUT TOOLS

In their natural state, bees always swarm some time during the summer. For some reason, probably because the hive has become overcrowded, the queen and a large number of the workers decide to emigrate and found a new colony. When the time comes, the workers who are leaving the hive fill their sacs with honey; then with the queen at their head or in their midst they issue forth in thousands. Scouts find a new place to make a nest—a hive set by the beekeeper, or some sheltered place like a hollow tree, and there begin life anew.



This is an old-fashioned hive called a skep. The bees which are clustering about it seem ready to fly off with their queen, and set up a home of their own.



This strange-looking object is a swarm of live bees. The queen has settled on the branch of an apple-tree, and the other bees are clustered about her.

Before a hive swarms, the emigrating bees gorge themselves with honey until they are like the small boy who has eaten too much bread and jam and is too sleepy to play. While they are in this state, they seldom sting, and it is quite safe for any one who does not shrink from them to handle them. Here a girl has thrust her hand fearlessly into the swarm. A swarm can generally be induced to settle in an empty hive by putting it close by, where the scouts can find it, or by putting the queen in it.

When the bee-keeper wants to know how many young bees there are in the brood cells of a hive, or how much honey there is in it, he puffs smoke in to stupefy the bees. He can then safely lift up the frame, with the bees on it, and examine it. If he wants to extract honey, he gently brushes the bees into the hive. If the hive is crowded, another story, called a " super," can be added to provide more room for honey.

If they make their new home in a hive scientifically planned, they will find frames inside ready for them, with foundations of wax prepared. Upon this they set to work at once to build cells for the reception of the eggs, or to store up honey. But, let us suppose that a swarm has escaped from the bee garden, and makes its nest in a hollow tree in the wood. They have nothing but a dark space, with rough walls all around them, in which to make a home. It is as if we ourselves were given some mighty cavern in which to build a city. But lacking tools and materials of every sort, how should we build? The bees are in a better position. It is true, they have no artificial tools with which to work, but in their bodies they have the tools they need to build their fairy city, and, cunning chemists that they are, they are able to produce the material for its walls from the honey that they ate before they left the hive.

THE MYSTERY OF THE CHANGE OF HONEY INTO WAX

As soon as they reach the new home, a great number of the young bees suspend themselves from the roof. Those highest hang by their legs; those lower down cling to the hind legs of those above; others at the sides cling as well and a great curtain of bees hanging down from the roof is formed. There they hang, for hours, or it may be two or even three days, until in some mysterious way the honey is changed into wax. Of the way that it is done, we know nothing, except that, as they are able in some way to increase the heat of their body, heat must have something to do with the process. When the wax is made, it issues as a clear liquid from pores under the wax plates, and soon hardens into thin flakes. Meantime other workers are running over the walls, removing every speck of dust and dirt or rubbish, and making all clean and smooth and neat. When at last the wax is ready, a bee climbs up to the centre of a frame. Then it carefully gathers the wax which has collected in six little plates in the wax pockets. This the bee chews and moistens with her tongue until it becomes a soft, glue-like mass, pliable enough to build the hexagonal cells of which the comb is made. When it is quite ready the worker sticks this wax to the roof, and leaves it there. This bee returns to her place, but others follow with their store of wax, and soon there is a little heap collected on the roof to form the foundation of the comb.

THE BEE ARCHITECT COMES TO DESIGN THE COMB

Then there comes forth an architect bee, which examines the wax with its antennae, or feelers, and finding all satisfactory, bores in the middle a hole, which is the beginning of the first cell. The material dug out is carefully pushed to one side to extend the walls of the cell. Other bees follow to deposit wax, and these give place to more architects, which excavate other cells, and the task of building the comb is now really on the way. If you look at the picture on page 2853 you will see that the comb is made of double rows of beautifully formed hexagonal cells. They are placed end to end, so that not only do the end walls of the cells form the partition between them, but the cells help to support one another. Each cell is the exact length required for the growth of a young bee. These double curtains of wax are made about half an inch apart, which allows the bees ample room to move between them, and they hang down about two thirds the depth of a hive. How did the bees learn to build these cells of exactly the right shape and size, without waste and of exactly the thickness that will hold the honey? These are questions that no one can answer. They belong to the mysteries of nature that overwhelm us by their greatness. When frames are provided, the building is very quickly done, but even when the foundations have to be laid, the work goes forward very rapidly.

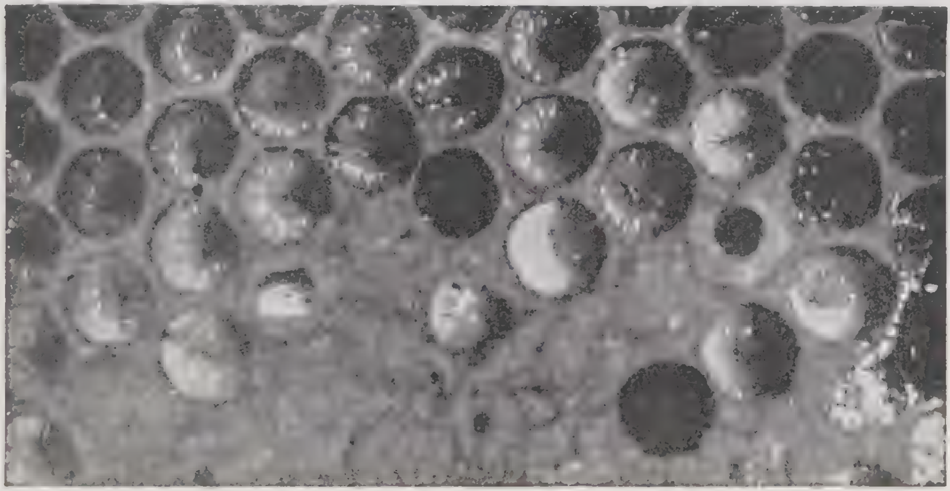
Meantime the important work of the hive has been begun. While the cells are being built, the queen has been very restless and discontented, and as soon as some are completed, she goes from one to another, and in each deposits an egg. Wherever she moves the bees around her stop their work and turn their heads toward her, and she is always surrounded by a swarm of attendants. When she moves away from one circle another surrounds her. She is petted and caressed, and kept constantly supplied with all she can eat of the choicest food.

HOW THE EGG TURNS INTO A GRUB AND THE GRUB BECOMES A BEE

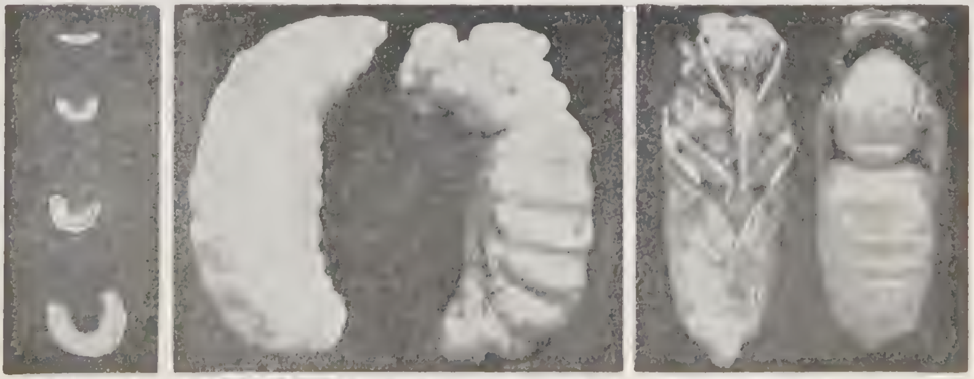
Now we must turn to the history of the egg. This is a little bluish-white thing, which is fastened to the bottom of the cell, and there remains for three or

THE DEVELOPMENT OF THE BEE

Here we see the eggs laid by the queen, before they have hatched out into grubs. The nurse bees feed the grubs for a few days with a substance called "bee-milk," "bee-jelly" or "chyle-food," which they prepare from honey they have eaten. The food is partly digested in the stomach of the nurse bee.



Here we see the young grubs. At the end of a few days the food of these baby bees is changed, and they are given a mixture of honey and pollen. When the grub has reached its full growth it straightens out in the cell. The nurses then put some food in the cell, which they cover skilfully with a porous cap.



These pictures show the growth of the bee from tiny egg to fully developed insect. To the left in the centre picture we see the full-grown grub after it has spun a thin silken covering. Next we may see how it changes its shape, and the right-hand picture shows it ready to eat its way out of the narrow cell.

four days. At the end of that time a little larva or grub appears. For a few days it is fed by the nursing bees with a food called "chyle-food," or "bee-jelly," which the nurses have specially prepared. For a few days longer the young grub is fed with a mixture of honey and pollen; but when a grub has grown so that it nearly fills the cell, a little honey and pollen is placed in the cell, which is capped with a thin plate made of wax mixed with pollen. For a short time the grub feeds on the food left in the cell. Then it spins itself a robe of silk—a cocoon inside the cell—and there it rests to let Nature work its way. In a few days its form undergoes a striking change. It is no longer a grub; its internal organs have been remade; wings and legs have grown, and in about twenty-one days from the time the egg was placed in the cell the young bee is ready to come forth into the hive. With her strong mouth she gnaws away the covering of her cradle. The nursing bees help her out, and the worker bee emerges ready to prepare herself for the tasks that crowd the hours of her short and busy life. The nursing bees bring her food, help her to dress her wings, and caress and encourage her, and in a day or two she is ready to help in the care of the hive, to take her share in nursing the baby bees, and in making wax for the new cells, in feeding the queen, and in storing the honey.

An important part of the work of the young bees is the ventilation of the hive. The hive is so densely crowded that, especially in the summer days, without ventilation the air would become so hot that the wax walls of the city would become soft, and bend. To guard against this, workers take up their stations on each side of the entrance, and vigorously fan with their wings. They create so great a current that the light of a match or candle held at the entrance is instantly blown out. The work is very exhausting and the fanners work in relays or shifts.

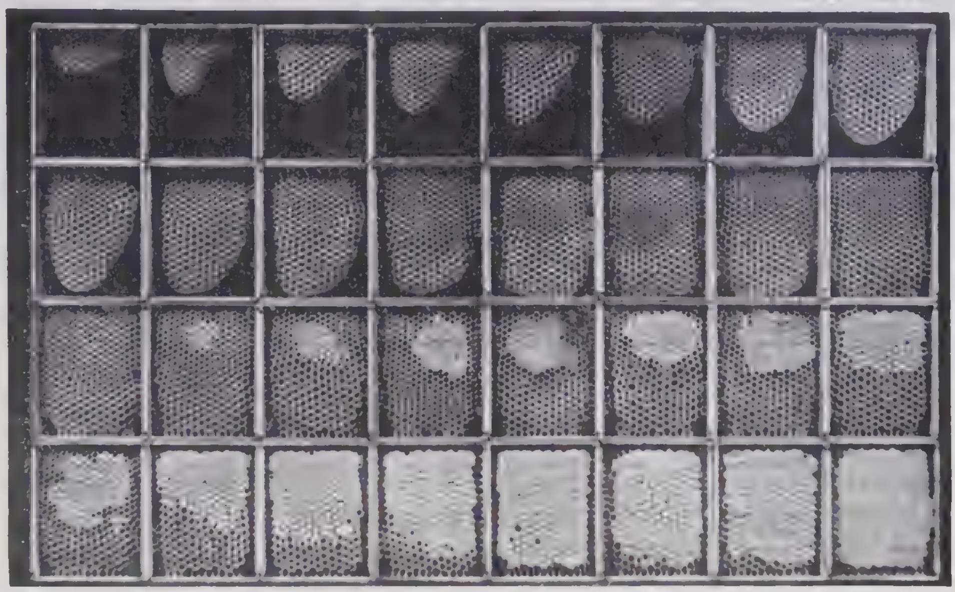
In less than two weeks after the worker leaves her cell, she tries her wings in the midday heat. A few days afterward she sets out on a search for honey and pollen, and until the moment of her death her life is a busy round of work.

THE STRANGE STORY OF THE QUEEN BEE'S LIFE

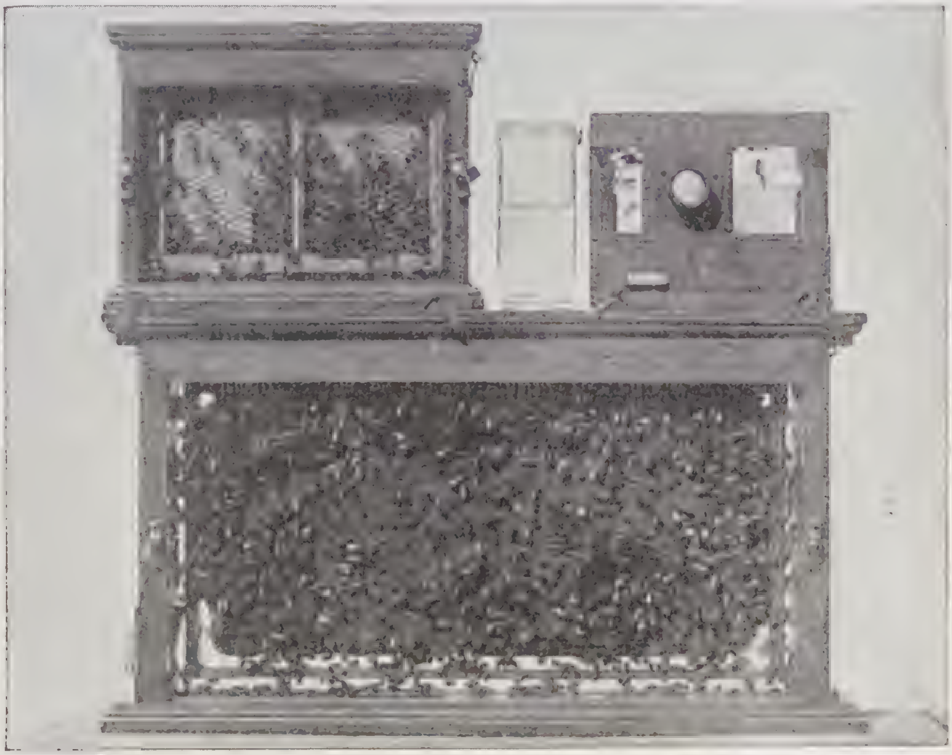
Now we must go back to the queen and her ceaseless work of laying eggs. It is said that the queen may lay from 3,000 to 4,000 eggs in a day. She begins to lay about February, and keeps on laying until about September. In the early part of the year, the workers make nothing but worker cells, but in the summer months some larger cells are made in which drone eggs are laid, and a few specially constructed cells are made for the future queens. These royal cells are built of a porous mixture of pollen and honey and are usually placed near the edge of the comb, where there is plenty of ventilation. Now the strange thing is that the egg placed in a royal cell is exactly the same as the egg that is laid in a worker cell. The difference between the growth of the workers and of the queens is created solely by the manner of their upbringing. Suppose that some great disaster should overtake the hive, that the queen should die before provision were made for her successor, all hope for the future would be gone. It would mean that the bees would simply abandon work and die. But, and this is a marvelous thing, if there are in the hive grubs which have been not more than three days out of the egg stage, the workers take one or more of these, enlarge the cells, and feed the grubs on the bee-jelly. The change must be made, however, before the grub is three days old, or the case is hopeless; but if the treatment is begun in time the worker grub becomes large and strong; an important change is made in the structure of her body, and she becomes a queen.

From the moment that the egg in the royal cell hatches out, the workers begin the special treatment needed for the growth of the young queen. No honey or pollen is given to this royal personage. She is fed solely on bee-jelly, and is fed so generously that she floats in this rich food in her large, airy cell. When the time comes for the young queen to turn into a pupa, she spins herself a silken robe, but this does not cover her entirely as the robes of the worker and drone cover them. The queen's cocoon reaches from the head down over only half of her body. The only part in which she can be stung to death is between the rings of which the abdomen is formed. These rings are deliberately left uncovered, so that if it is her fate to die, she lies ready to be immediately sacrificed, unprotected by the silk which would hamper the fatal

HOW THE BEES WORK FROM DAY TO DAY



This shows how a section of honeycomb is built. In the upper left corner we see the beginning. In the lower right-hand corner the section is filled and every cell sealed with a wax cover. The sections are placed in a " super " on top of the hive. As the passage from the lower hive is too small for the queen to pass, all the cells are filled with honey. Usually time is saved by supplying a foundation sheet of wax.



This " observation hive " is made so that the bees may be watched at their work. The queen is somewhere among the crowd in the lower hive, and all the bee activities are in full swing. The picture gives a good idea of the two-sided structure of the comb. On top of the hive there are two sections like those above and an apparatus for giving the bees artificial food, as they cannot get out to gather honey.

Pictures copyright, Brown & Dawson; also top of page 2853, middle of pages 2851 and 2860.

sting. The young queens grow more rapidly than the workers, and reach their full growth in about fifteen or sixteen days after the eggs are placed in the cells. They are not allowed to leave the cells at once, however. The workers pierce a hole in each cell door through which the queens are fed, but they are not permitted to leave the cell until the old queen is removed by death, or departure with the swarm.

HOW THE WORKERS CARE FOR THE YOUNG QUEEN

But the better to trace the life of the young queen, let us fancy ourselves back in the hive from which our first queen and her swarm of bees proceeded. A short time before she left, the young queens were ready to leave their cells. But the workers kept a close watch. The young queens were kept prisoners lest they should become the victims of the fury of the old queen, who would fall upon them and sting them to death. After the swarm has left, and the old queen with it, the workers again settle down to their tasks. The unrest of the swarming time is over, and the steady hum of the working bees begins again. But the hive is now queenless, and the workers hasten to help the young queens to freedom, and now comes one of the tragedies of the bee community.

As the most advanced queen emerges from her cell, the nurses rush to help her. They caress her, offer her honey from their mouths, brush and clean her to remove any shreds of stickiness which may have adhered to her in the cell. As soon as the little stranger feels strength come into her legs and jaws, she is seized with fury. No other queen must live while she is in the hive, and if the workers let her, she will rush to the cells of her sister queens, tear open the cells, and sting the occupants to death. It sometimes happens, however, that the hive has been so much overcrowded that its numbers, after the first swarm, are still too great. In that case the workers keep the new queen from destroying the royal cells; she leaves the hive with another swarm and another queen is allowed to live. Sometimes it happens that more than one queen comes from the cells on the same day. In such a case the queens fight one another and sting one another to death until only one is left.

It sometimes happens that the two bees in their struggles find themselves so placed that each could kill the other at the same moment. If they both struck now, they would die and leave the hive without a queen. They do not strike; they break away, terrified at the danger that both may be killed, and they fight again until one, more skilful or stronger than the other, can implant its sting, inflicting the fatal blow. The victor is always dutifully received as the sovereign.

During the next few days many more worker bees are hatched from the eggs which the other queen had laid, and the new queen, after one trip to the skies, will begin to lay her eggs. She in turn will now want to lead away a swarm of bees to set up a colony for themselves, and the bees are just as anxious to go. In a wild state the bees will send off several swarms in succession, from five to ten days elapsing between the departure of each swarm. But in hives owned by men this number of swarms is not permitted, or the hive would become too weak. Indeed, if the beekeeper can prevent them, the bees do not swarm at all. The queen and her court feel the desire to go, and forth they fare, flying at first only a short distance from the hive. There, upon some bough, they hang in a bunch, the bees frantically clustering about their queen to prevent her being injured.

BEES THAT FILL THEMSELVES WITH HONEY ARE TOO LAZY TO STING

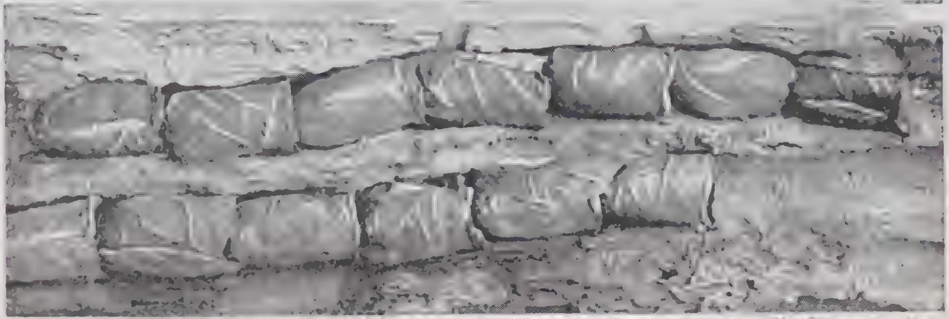
The prudent beekeeper now comes along, holds a hive upside down under the bees, and by shaking the bough up and down causes them to drop into it. He knows that they will not sting him; they have filled themselves so full of honey before quitting the hive that they have no desire to injure anybody. That, by the way, is the reason why, when we want to withdraw part of the comb containing the honey, we " smoke " the bees. We use a small pair of bellows which has attached to it a tin cup in which a piece of rag is smouldering. The bees do not understand the smoke; they think that something dreadful has happened to the hive and that they may be compelled to leave. So they rush to their stores of honey and fill themselves with the sweet food, in case they have to set forth on a journey. When they are in that condition they never sting unless they are ill-used.

The affection and reverence which the

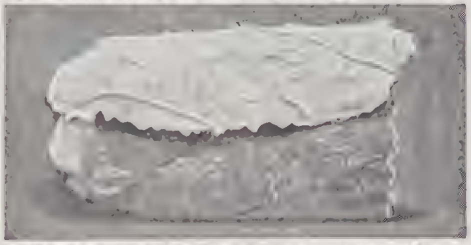
A BEE'S CRADLE MADE OF ROSE LEAVES

This may be the very first visit of this leaf-cutting bee to a snapdragon flower, but instinct teaches her how to force her way in to extract the honey.

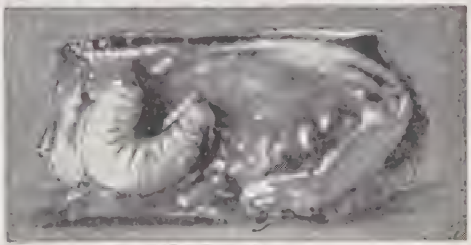
On the other pages we see how swarms of bees work together, but this leaf-cutting bee works alone. Here she is cutting rose leaves for her nest.



The bee stores each leaf in a tunnel which she has bored in the decayed wood of a tree. She fills each rolled-up leaf with honey and then lays an egg in it. This is a picture of wood cut open to show two such tunnels.

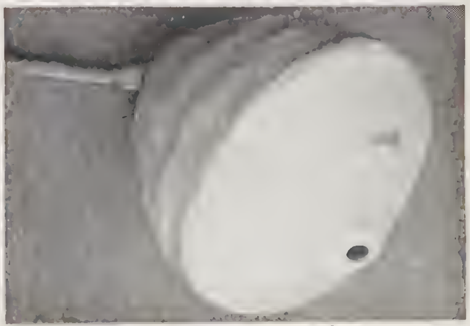


This is a nearer view of one of the rolled-up leaf-cells which we have seen above; it is full of honey.'



Here we see the leaf-cell cut open. Inside is the little bee grub eating the honey stored by its mother.

A wasp is a very nasty insect to touch, but it is very clever. British tree-wasps build a nest like this. The nest in early summer is like a small plum, but soon it grows to be the size of a football.



Here is a wonderful wasp's nest, cut from an orange-tree in Brazil. Made of a substance like stout cardboard, it is really wood pulp, collected and worked up by the wasps. The little black hole is the entrance.

bees show their queen cannot be exaggerated. If famine overtakes the hive, they feed the queen with the best food remaining; and if the queen be sent away packed up in a tiny, tiny hive, with her personal attendants accompanying her, they feed her so long as a scrap of food remains, and die themselves rather than take anything that she might eat.

In spite of all this devotion, the stories we sometimes hear about the queen ruling over the hive are not true. The workers rule the hive, and decide what is to be done. They take care of the queen because she is the hive-mother, and without her there would soon be no bees, but the workers settle the important questions.

Modern hives are made so that the bees can be handled easily. The beekeeper takes out a queen, gives the bees another, or divides a colony whenever he thinks best. As the combs in the lower part of the hive often have young bees in them, or are dark in color, he puts special frames, or else small boxes called sections, in the upper story of the hive, in order that the bees may fill them with honey. The openings to the upper story are made too small to allow the queen to get through to lay eggs, and so the sections are filled with clear honey. You have seen these beautiful little wooden boxes many times, no doubt.

The beekeeper, or apiarist, as he is sometimes called, removes these sections and sells them. If he has placed frames above, he may cut off the caps which the bees have placed over the full cells, and put the frames into an extractor, which draws out the sweet liquid. This is the honey you buy in bottles or jars.

IF ANY BEE WILL NOT WORK NEITHER SHALL HE EAT

When we come to read all about bees in big books, or examine the hive for ourselves, we shall have to follow the lives of the drones more closely than we have here. Their lives are short and idle. They exist only that the queen bee may choose a mate from one—not of her own hive, but from the drones of another hive, while her hive supplies drones as mates for other queens. The worker bees have to feed the drones, but when the summer is ending they turn them all out of the hive to die, or else imprison them inside and starve them to death, or actually kill them. It is said that when they turn them out, the workers bite off one wing so that the drones cannot fly back into the hive, but miserably perish in the chilly night. The drones have no stings and cannot fight.

One little point we must note before leaving the hive. For all their skill, the bees are sometimes deceived. If the hive becomes weak and careful watch is not kept, the bee moth creeps in unobserved and lays her eggs in the hive. These eggs hatch out and crawl over the comb, eating the wax and leaving a nasty cobwebby trail behind. Nothing else can get in, in the ordinary course, for there are sentinels at the door, who examine every creature, friend or foe, that seeks to enter. A strange bee is at once killed or expelled, unless it brings honey, when it will be welcomed. Sometimes a big snail will enter, regardless of stings. The bees cannot have him there alive, so they wall him up. They seal up his shell with their wax, burying him alive, if they do not first sting him to death. If the shell be broken, they cover him entirely, so that no bad fumes shall escape.

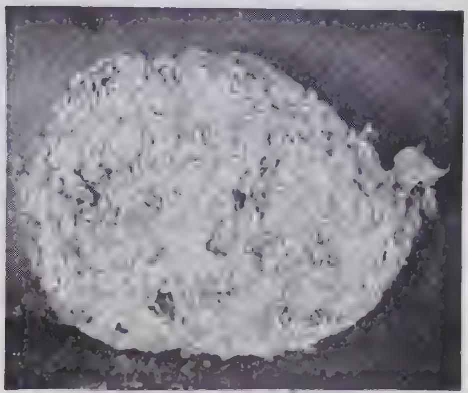
THE BEE'S LONG TONGUE THAT SUCKS UP NECTAR FROM THE FLOWERS

The doings of the worker bees out in the fields and gardens are as interesting as those in the hive. They have a curious sucking tongue, covered with hairs. This they protrude from a strong sheath, which acts as a channel, up which they draw the nectar from the flowers. When they enter a flower in which the nectar lies ready, they stretch out their tongues and suck up all that is available. If the nectar lies hidden, they bite their way through that part of the flower which obstructs them, and so reach it. The pollen that they collect, as they go from flower to flower, is highly important to them and to the flowers. It gets dusted over their bodies, and, as they go from bloom to bloom, the pollen of one flower is transferred to another, so carrying fertilization to each. They always take the same sort of flower on one round, so that they should not mix the pollen of various plants.

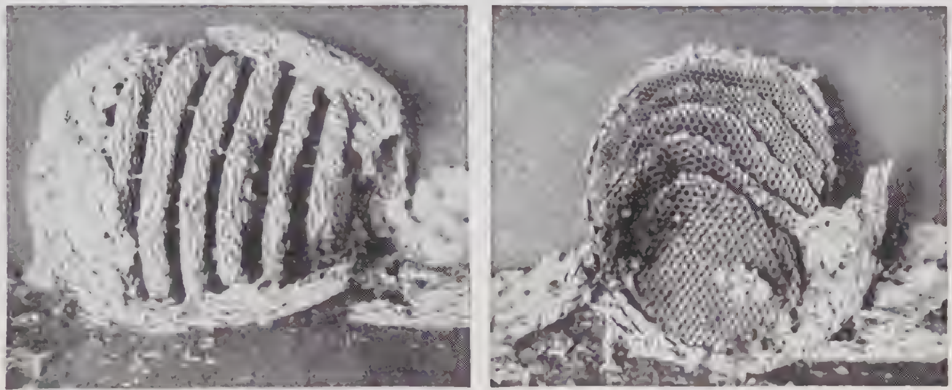
The pollen that clings to them they scrape off with their claws, and deposit in two tiny baskets which they have on the joints of their hind legs. A little of the pollen they eat as food, but the bulk of it they carry back to the hive, where the workers take it from them and use it at

THE STRANGE HOMES OF WASPS

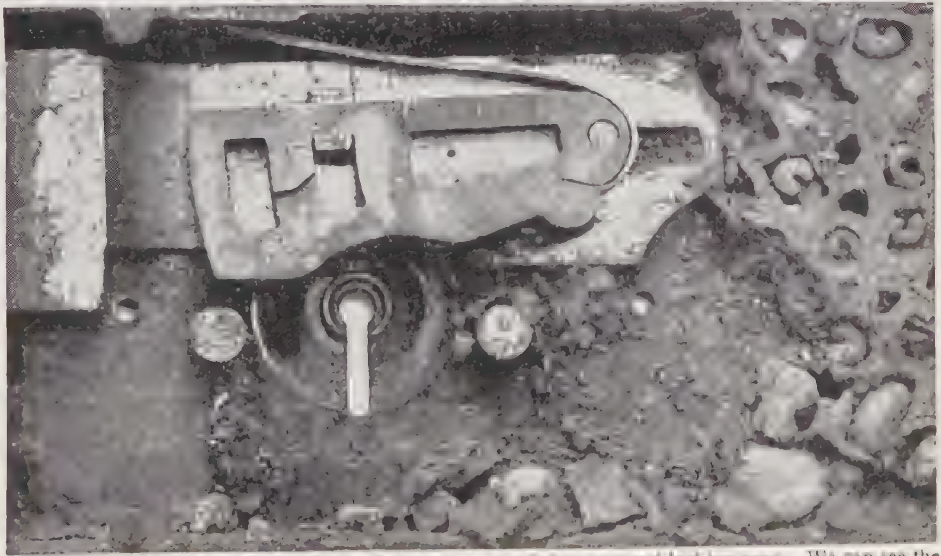
When we see wasps flying in and out of a hole like this, we may know that their nest is inside the hole. It is built some feet under the ground.



Wasps are destructive insects, so men have to kill them. They suffocate the wasps with burning sulphur, and dig out the nest, which is like this.



Stripped of the paper-like covering which the wasps have made, the nest is seen to consist of a series of cell-combs. Here we get, first a side view, and next a front view of a nest dug out of the ground. This wonderful home was partly built by a single wasp before she had any children to help her.

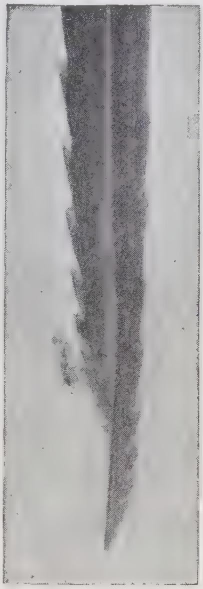


This is the inside of a door-lock. In it a Solitary wasp made her nest and laid her eggs. We can see the grubs in their cells. Perhaps because their mother did not leave them enough food they died of starvation.

once as food for the grubs, or store it in cells set apart for the purpose. The nectar which the bees sip is swallowed. Some of it is used to give the bee strength, but the great part passes immediately from the bee's mouth into the honey-pouch, where it becomes changed into honey. This honey is delivered to the hive and stored in cells, which are capped with wax as fast as they are filled.

THE WINTER LIFE OF THE BEE IN THE HIVE

When the flower season is over, and the honey-making done, the queen stops laying and the bees collect in a mass in one part of the hive. They do not sleep, and in the middle of a warm bright day many of them leave the hive, fly about in the sunshine, and bring back water to the hive. If they have not enough honey and pollen to keep them through the winter, the beekeeper supplies them with syrup to take its place. In February the queen again begins to lay eggs, and the workers again begin to pay her the attention that they ceased to show her throughout the winter months. As soon as the early spring flowers appear, the workers again begin to ply their trade, and life awakens in the hive.



The Tongue of the Bee.

A queen bee lives to the age of two or even three years. But when she begins to show signs of age, and her steps grow feeble, the workers gather round her in a mass and smother her to death, and one of her children takes her place. The life of most of the worker bees is short. Those that are born in the early summer toil so hard that they live only from three to six weeks. Those that are born at the end of the summer, however, live in the hive throughout the winter, for they are needed to care for the young bees who are born in the spring.

A STORY OF WASP LIFE

It is easy to tell the difference between bees and wasps. The wasp is of a lighter color, is more slender in build, and is not so hairy as the bee. The wasp does not make honey from the flowers, nor does it carry pollen from one to the other to fertilize it.

Although the full-grown wasps live partly on nectar from the flowers or sweet ripe fruit, the young wasps are carnivorous and must have insect food. Some wasps, who live a solitary life, sting living insects—a cricket, a weevil, or perhaps a cicada. The sting does not kill the insect, it only paralyzes it, and it is then dragged to the nest, and the wasp lays an egg on it. Then another insect is found, and another and another. The same process is gone through in every case, and the wasp goes off secure in the knowledge that she has laid up a store of food for the children she will never see.

Some wasps are solitary. There are mason and potter wasps, some of which make beautiful nests, digger wasps who dig tunnels in the ground, wasps that tunnel in the stems of plant, and wasps that lay their eggs in the nests of other wasps. Those that we know best, however, are the social wasp, the yellow-jackets and the hornets, who make large nests and, like the bees, live a social life in common.

The common wasp makes a very nice nest. The queen wasp goes to sleep for the winter in some sheltered place. When she wakes up in the spring, she finds herself without a single relative in the world. She makes a cell or two, and lays eggs in them, thus acting as both worker and queen. These eggs produce worker wasps, who build other cells, and soon a big nest is formed. Sometimes the nest reaches an enormous size, but it has all been done in a summer. All save the queen wasp die in the autumn. Of course, in a year of many wasps there remain many queen wasps.

Some of the social wasps build underground, others build the beautiful paper nests which nearly every country boy or girl knows. The covering of the nest is really made of paper. It is made from fibres of wood which the wasp chews and flattens out until it looks like a tiny ribbon, which is plastered on the nest. Inside the nest combs composed of cells are made, and in these cells the young wasps live and are fed until they have reached their full growth.

THE NEXT NATURE STORY IS ON PAGE 2965.

The Story of FAMOUS BOOKS

THE STORIES OF CHARLES DICKENS

THE last of the famous novels of Charles Dickens which we are to read here is known to have been his own favorite, for he tells us so in the preface to it. It is also, in some details, true to his own life. As we have read his life in the "Book of Men and Women," page 2326, we can see where the story resembles the biography. "David Copperfield" is written in the first person, but there are so many things to tell in it, and so little space to say them in here, that we have told the story in the third person. Although the book is a very long one, this short summary conveys its leading features. Our illustrations are from copies of the original pictures drawn for the story more than fifty years ago.

DAVID COPPERFIELD

CONTINUED FROM 2780

THE hero of this story was born, after his father's death, in a quaint old house, called the Rookery, at the village of Blunderstone, in Suffolk. There were very few relatives of his father or mother alive. Indeed, Mrs. Copperfield, now that her husband had died, and she had become the mother of David, seemed to have nothing in the world to live for but the care of her infant child. She was the delicate, clinging type of woman, not at all one of those bright, courageous women who, having felt the sorrow of a great loss, can still have heart of grace to struggle bravely against misfortune.

Nor did she receive any help in her time of trouble except from her rosy-cheeked, warm-hearted servant-maid, Clara Peggotty, who loved the gentle woman and her child. David's aunt, Miss Betsy Trotwood, the sister of his late father, might have made matters much better for his mother; but she was a strange woman, and, calling at the Rookery the very night that David was born, she was so disappointed to find that the child was a boy and not a girl—she had hoped it would be called Betsy Trotwood, after her—that she went away, and never saw David's mother again. A strange, hard-hearted woman, you may think; but later on we shall see if that is true.

David's early days were pleasant enough; what with the fond Peggotty and his gentle mother always thinking of his happiness, perhaps he was rather a spoiled child. But suddenly all was changed. A very haughty, overbearing man, named Edward Murdstone, had met the young widow of the Rookery, and determined to make her his wife and himself master of the little property that she possessed. He was a wine merchant, but not a wealthy man, and a colder-hearted stepfather could not have been imposed on little David, who was now a bright, observant boy of some four or five years. David hated the tall man with the black whiskers, and he was right in doing so; for when Murdstone did become his stepfather he crushed all the joy out of the little boy's life.

Before long David's mother also began to lose heart, for she was overruled in everything by Murdstone and his domineering sister, who took up her abode in the Rookery, and quickly took all the affairs of the house and home into her own hands. But for Peggotty's loyalty to David and his mother, the lives of both of them would have lost all sunshine. As it was, a day came when little David could not stand his stepfather's ill-treatment of him any longer, and he bit the hand of Mr. Murdstone when that person was engaged in punishing him for some imaginary offence.

The result of this conduct was that David, now about nine years of age, was packed off by the stage-coach, with a little box of clothing, all the way to London, where, at Salem House School, Blackheath, Mr. Murdstone had arranged for the boy to become a boarder, under the notorious Mr. Creakle, a master whose one idea of education was to thrash the boys daily. We remember Mr. Squeers, who kept Dotheboys Hall, as a terrible schoolmaster of that time, but he was little worse than Creakle. One of the tutors, poor-spirited but kindly Mr. Mell, met David at Whitechapel, and took him to Salem House, and we shall hear how he was received there in his own words.

LITTLE DAVID'S FIRST UNHAPPY DAY AT SALEM HOUSE SCHOOL

"Salem House was a square brick building with wings, of a bare and unfurnished appearance. All about it was so very quiet, that I said to Mr. Mell I supposed the boys were out; but he seemed surprised at my not knowing that it was holiday-time, that all the boys were at their several homes, that Mr. Creakle, the proprietor, was down by the seaside with Mrs. and Miss Creakle, and that I was sent in holiday-time as a punishment for my misdoing. All of which he explained to me as we went along.

"I gazed upon the schoolroom into which he took me, as the most forlorn and desolate place I had ever seen. I see it now. A long room, with three long rows of desks, and six of forms, and bristling all round with pegs for hats and slates. Scraps of old copy-books and exercises litter the dirty floor. Some silkworms' houses, made of the same materials, are scattered over the desks. Two miserable little white mice, left behind by their owner, are running up and down in a fusty castle made of pasteboard and wire, looking in all the corners with their red eyes for anything to eat. A bird, in a cage very little bigger than himself, makes a mournful rattle now and then in hopping on his perch, two inches high, or dropping from it, but neither sings nor chirps."

DAVID FINDS THE STRANGE PLACARD: "TAKE CARE OF HIM—HE BITES"

"There is a strange, unwholesome smell upon the room, like mildewed corduroys, sweet apples wanting air, and rotten books. There could not well be more ink splashed about it, if it had been roofless from its first construction, and the skies had rained, snowed, hailed, and blown ink through the varying seasons of the year.

"Mr. Mell having left me, I went softly to the upper end of the room, observing all this as I crept along. Suddenly I came upon a pasteboard placard, beautifully written, which was lying on the desk, and bore these words: *Take care of him. He bites.*

"I got upon the desk immediately, apprehensive of at least a great dog underneath. But, though I looked all round with anxious eyes, I could see nothing of him. I was still engaged in peering about, when Mr. Mell came back, and asked me what I did up there?

"'I beg your pardon, sir,' says I; 'if you please, I'm looking for the dog.'

"'Dog?' says he. 'What dog?'

"'Isn't it a dog, sir?'

"'Isn't what a dog?'

"'That's to be taken care of, sir; that bites?'

"'No, Copperfield,' says he gravely, 'that's not a dog. That's a boy. My instructions are, Copperfield, to put this placard on your back. I am sorry to make such a beginning with you, but I must do it.'

"With that he took me down, and tied the placard, which was neatly constructed for the purpose, on my shoulders like a knapsack; and wherever I went afterwards I had the consolation of carrying it. What I suffered from that placard nobody can imagine."

THE BOYS TEASE DAVID ABOUT HIS PLACARD, BUT HE FINDS A CHUM

Here was, indeed, a terrible beginning to David's schooldays—for he was a sensitive boy, and no punishment could have equaled in its brutal effect this arranged by Mr. Murdstone. The lad spent many miserable days in terror of what would happen when the school term began again and the other scholars came to find him a subject of mockery and mirth. But when they did come, their taunts of "Lie down, sir!" and "Towzer!" were hardly worse than the fears of his loneliness. Besides, handsome James Steerforth, the head-boy of the school, speedily made a friend of David, and very readily spent for him the seven shillings which had been given to David by his mother and Peggotty.

Steerforth certainly made the little fellow's life pleasanter than it could otherwise have been, and David Copperfield conceived a great admiration for him, which Steerforth seemed to return in some degree of affection for his little friend. They read stories together, and really made the best of a very uncomfortable and ill-kept school. But Steerforth, who was much older than the other boys, and had great influence with the despicable Creakle, abused his power by picking a quarrel with poor Mr. Mell, the result of which was the discharge of that ill-used tutor. Even this indication that he could be cruel as well as kind did not shake David's faith in Steerforth, and he remained his object of admiration, while with Traddles, another schoolmate, who seemed to be the most unfortunate of little fellows, he was also very friendly.

At the end of six months David was allowed to go home for the holidays, and, to his surprise, he found his mother nursing a baby sister, who had arrived while he was at Salem House. His mother made every effort to appear happy, but even the boy could see she was not happy, and the fact that Mr. Murdstone ordered him about like a dog, and would not let him be friendly with Peggotty, his old nurse, made home almost less endurable than Salem House, to which he was glad to return at the end of his unhappy holidays. But he had only been two months back at school when his mother and her baby died, and David had to make the long journey by coach to Blunderstone to be present at her funeral. The one comfort in all his sorrow was faithful Peggotty, who hated the Murdstones as much as she had loved David and his mother.

Of course, Peggotty got notice to quit the Rookery as soon as David's mother was buried, for Mr. Murdstone and his sister had only allowed her to remain because of her late mistress having had no other servant all her married life. The Murdstones cared so little for David, however, that they had no objection to Peggotty taking him with her for a time to the home of her brother, Mr. Peggotty, on the beach near Yarmouth. This place was known as the Ark, and a quainter home you could not imagine.

It was just an old wooden vessel turned upside down, with a chimney fixed where the keel used to be. David was entirely charmed with it the first time he saw it.

STEERFORTH MAKES TROUBLE FOR POOR MR. MELL AT SALEM HOUSE SCHOOL

" If it had been Aladdin's palace, roc's egg and all, I suppose I could not have been more charmed with the romantic idea of living in it. There was a delightful door cut in the side, and it was roofed in, and there were little windows in it ; but the wonderful charm of it was that it was a real boat which had no doubt been upon the water hundreds of times, and which had never been intended to be lived in, on dry land. That was the captivation of it to me. If it had ever been meant to be lived in, I might have thought it small, or inconvenient, or lonely; but never having been designed for any such use, it became a perfect abode.

"It was beautifully clean inside, and as tidy as possible. There was a table, and a Dutch clock, and a chest of drawers, and on the chest of drawers there was a tea-tray with a painting on it of a lady with a parasol, taking a walk with a military-looking child who was trundling a hoop. The tray was kept from tumbling down by a Bible; and the tray, if it had tumbled down, would have smashed a quantity of cups and saucers and a teapot that were grouped around the book. On the walls there were some common colored pictures, framed and glazed, of Scripture subjects. There were some hooks in the beams of the ceiling, the use of which I did not divine then; and some lockers and boxes and conveniences of that sort, which served for seats and eked out the chairs.

"All this I saw in the first glance after I crossed the threshold—child-like, according to my theory—and then Peggotty opened a little door and showed me my bedroom.

THE INSIDE OF THE ARK AND THE QUAINT FOLK WHO LIVED IN IT

"It was the completest and most desirable bedroom ever seen—in the stern of the vessel; with a little window, where the rudder used to go through; a little looking-glass, just the right height for me, nailed against the wall, and framed with oyster-shells; a little bed, which there was just room enough to get into; and a nosegay of seaweed in a blue mug on the table. The walls were white-washed as white as milk, and the patch-work counterpane made my eyes quite ache with its brightness."

THE COSY SCENE INSIDE THE ARK

Here we see Mr. Peggotty, Ham, Clara Peggotty, Mrs. Gummidge, and Little Emily. David Copperfield is seated on a chair.

WHAT THE ARK WAS LIKE OUTSIDE

Little Emily on the beach near her home

And the folk that lived at the Ark were as quaint as their abode. First there was Dan'l Peggotty himself, a tall, burly fisherman, whose heart was as soft as his whole appearance was rough; then there was Ham Peggotty, his orphan nephew, the boat-builder, a great burly young man, just as simple-hearted as his uncle; and Mrs. Gummidge, the widow of Mr. Peggotty's former partner in the fishing trade. Mrs. Gummidge seemed to be the most miserable, moping, grumbling woman in the world. She was always lamenting her uselessness, her "lone, lorn" condition, the fact that she was a burden on Mr. Peggotty, but all the while she did the work of the house splendidly, and kept everything neat and clean, and when great sorrow came to them all, Mrs. Gummidge proved herself a woman of courage and a brave heart. Last, but not least, was Little Emily, the daughter of Mr. Peggotty's brother-in-law, who, like the father of Ham, had been "drowndead." Emily was a very beautiful child, and she and David played, rather shyly, perhaps, at being sweethearts. She had a very great love for her uncle, who loved her better than anything else in the world, and yet she was fated to bring to him the greatest sorrow of his life.

When Clara Peggotty brought David here among these simple,

DAVID SURPRISES HIS AUNT BETSY
After a walk from London he arrives at Dover.

good people, he was as happy as he could be, and he clung to them all as his only friends, now that his mother was dead. With Emily he attended the very quiet wedding of Clara and Mr. Barkis the carrier, which took place during his stay at the Ark. Barkis had long wanted Clara Peggotty for his wife, and had really proposed to her through David, by getting him to say to her, "Barkis is willin'!" meaning that when she was ready to marry he was willing to have her. But she would not have married him if her dear mistress had not died. Barkis had a fine little house ready waiting for her, and one of the bedrooms was to be kept for David whenever he wanted it; so that he had a home after all, though the horrid Murdstones had usurped the Rookery. Murdstone's main desire was now to be rid of his stepson, and when David returned to Blunderstone, he found that arrangements had been made for him to be employed in the warehouse of the London wine merchants in which Mr. Murdstone had some interest. His wages would be enough, he was told, to buy his food and clothing, and his lodgings and washing would be paid for by his stepfather. So off the boy was packed to London to make his fortune.

The rat-infested warehouse of Murdstone and Grinby's was on the Thames at Blackfriars, and the work which David was given was of the most menial kind. He was sent to lodge with a Mr. Micawber, then living off the City Road, and thus began an acquaintance that was fated to last for many years. Mr. Micawber was an extraordinary man. In appearance he was tall and of good presence, an extremely large bald head rising like a shining egg out of a most imposing shirt-collar. His clothes were like those of a rather shabby actor. And, indeed, Micawber was something of an actor. He loved to speak in long-winded sentences, full of extraordinary words, and he was always on the point of doing something remarkable—which he never did. He was really a failure in everything, and was in debt to everybody, always promising to square accounts when something turned up, but nothing ever "turned up" with him. His wife boasted of her grand relatives, whom nobody ever saw, and made a great show of her shabby fineries. The Micawbers had four children—a boy and a girl, somewhat younger than David, and two infants who were twins.

DAVID IS HAPPY IN THE SHABBY HOME OF THE MICAWBERS

On the whole, David found the shabby home of the Micawbers not too comfortless, but he suffered great misery at the warehouse, where he toiled as no boy of his age and upbringing should have been allowed to toil, among ignorant, rough men and lads. Mr. Micawber got put in prison for debt, but David was faithful to him, and when Mrs. Micawber and her family also removed into the prison—as they could do in those days—a room near

A PEEP INTO THE HOME OF URIAH HEEP
David has gone with Uriah to take tea with him and his mother in their "'umble" abode, when Mr. Micawber pops in.

to it was hired for their young lodger, who had so great a liking for Micawber that he had no wish to be separated from that good-natured, genial, but hopelessly impracticable person. In the course of time Micawber was liberated again, and with his family set off for Plymouth, where his wife's grand relations were supposed to have great influence, and "something might turn up" if he were on the spot.

HOW DAVID RAN AWAY FROM LONDON AND FOUND HIS AUNT BETSY

David parted from them with sorrow, and soon after decided to run away from the hateful bottling warehouse. He wrote to Mrs. Barkis to lend him half a guinea, and to tell him if she knew where his aunt, Betsy Trotwood, lived. His dear old nurse sent him the money, but could only say that his aunt lived somewhere near Dover or Folkestone way. Even with so vague a destination, David set out, but had not got clear of London before he was robbed of his box and his money; so that he had to suffer terribly before, by dint of much inquiring, he found himself in dirty rags at the door of his aunt's comfortable little house at Dover. The lady was amazed to see the ragged boy, who told her she was his aunt and that his name was David Copperfield. There lived with Miss Trotwood an elderly man named Richard Babley, but better known as "Mr. Dick." He was not quite sane, but Miss Trotwood always declared he had a great deal more sense than he was given credit for, and she often acted upon his advice. She now sent her servant to call him, and asked him what she should do with David.

"Why, if I was you," said Mr. Dick, considering the matter and looking vacantly at David, "I should—I should wash him."

"Janet," said his aunt, "Mr. Dick sets us all right. Heat the bath!"

DAVID'S HAPPY SCHOOLDAYS IN THE OLD TOWN OF CANTERBURY

And so began a new and happy chapter in David's life. Instead of being the sour old woman we might have expected, from her conduct the night David was born, she proved the kindest and best of aunts, and forgave David for being a boy, but made him call himself Trotwood Copperfield in future. He had many happy days with Mr. Dick, whose great trouble was that he could not avoid mentioning King Charles's head in a memorial he was writing out to submit to the Government. King Charles's head would come in somehow, and then he had to begin all over again. But otherwise Mr. Dick was a quiet and interesting old gentleman, who loved to fly large kites, and he got on excellently with David, whose aunt at length decided to send him to Dr. Strong's academy at Canterbury. She made arrangements for him to board at the house of her lawyer there, Mr. Wickfield, whose beautiful and wonderfully intelligent young daughter, Agnes, looked after the house, Mrs. Wickfield being dead.

David was extremely happy here, both at school and at home, and came to regard Agnes as his chum, to whom he could tell his inmost thoughts. The only person he did not like was Mr. Wickfield's clerk, a young man named Uriah Heep, who forced his acquaintance on David, and always pretended to be very humble. "I am well aware," he said, "that I am the 'umblest person going, let the other be where he may. My mother is likewise a very 'umble person." This fellow really hated David because he and Agnes were such warm friends, and the cringing scoundrel was to cause much trouble to that little household later on.

DAVID'S AUNT CHOOSES A PROFESSION FOR HIM AND FITS HIM OUT

The happy days at Canterbury came to an end, and David's aunt furnished him with money to take him to London, or wherever he cared to go, for a time, as a holiday, during which he might consider what his next step in life was to be. He went to London, and there by chance met Steerforth, for whom all his old admiration remained. That breezy, pleasure-seeking young man accompanied him on a visit to the Peggottys, "just for the fun of the thing," as we say. He pretended to be very interested in all he saw at Yarmouth. David, in the meantime, had thought very little about his next step, and a letter from his aunt decided it. By paying a thousand pounds to the firm of Spenlow and Jorkins, she could get him taken as a pupil in a branch of the law which related chiefly to Church matters and marriages. He might become a "proctor," which was a good paying profession. Steerforth said it was all right, and David fell in with his aunt's views. When he got back to London, Miss Trotwood made him as cosy as ever a young gentleman was, and engaged most comfortable chambers for him. He soon began to fancy himself quite a young man of fashion, and delighted to entertain Steerforth at his rooms. In his profession he made no great progress; but Mr. Spenlow invited him to his house, and he was at once over head and ears in love with Miss Dora, his employer's motherless daughter, a fragile but bright and lively girl, who also fell in love with him.

Alas! when all seems brightest for our hero, trouble is brewing in many different ways. Uriah Heep gets Mr. Wickfield under his thumb, by preying upon that gentleman's weakness for lingering too long over his wine after dinner, and manages to implicate him in some swindling transactions. Little Emily is to be married to honest Ham, but she runs away with Steerforth, and gloom and mourning descend among the simple folk at Yarmouth. David aspires to marry Dora Spenlow, but suddenly he receives information from his aunt that she has lost all her fortune except the house at Dover, which she has let, and is coming to take up her abode with him in London, while Mr. Dick will get lodgings in the neighborhood. David sees his hope of success as a proctor vanishing, for he can no longer think of going on without earning some money to help his aunt. He cannot get anything of the thousand pounds she paid returned, and presently the firm are proved to be very hard up for money, Mr. Spenlow dying and leaving his daughter unprovided for, instead of an heiress, as most people had supposed. So David has to earn some money as secretary to his old schoolmaster, Dr. Strong, now in London and engaged in compiling a dictionary, while he also learns shorthand and becomes a reporter. Mr. Micawber turns up about this time with great prospects, and invites David and Traddles, who is studying for the Bar, and with whom David has renewed his old friendship, to a little farewell party, at which he makes this speech.

DAVID AND TRADDLES AT MICAWBER'S PARTY.

"My dear Copperfield," said Mr. Micawber, rising with one of his thumbs in each of his waistcoat pockets, "the companion of my youth—if I may be allowed the expression—and my esteemed friend Traddles—if I may be permitted to call him so—will allow me, on the part of Mrs. Micawber, myself, and our offspring, to thank them in the warmest and most uncompromising terms for their good wishes. It may be expected that on the eve of a migration which will consign us to a perfectly new existence"—Mr. Micawber spoke as if they were going five hundred thousand miles—"I should offer a few valedictory remarks to two such friends as I see before me. But all that I have to say in this way, I have said. Whatever station in society I may attain, through the medium of the learned profession of which I am about to become an unworthy member, I shall endeavor not to disgrace, and Mrs. Micawber will be safe to adorn. Under the temporary pressure of pecuniary liabilities, contracted with a view to their immediate liquidation, but remaining unliquidated through a combination of circumstances, I have been under the necessity of assuming a garb from which my natural instincts recoil—I allude to spectacles—and possessing myself of a cognomen to which I can establish no legitimate pretensions. All I have to say on that score is, that the cloud has passed from the dreary scene, and the God of Day is once more high upon the mountain-tops. On Monday next, on the arrival of the four o'clock afternoon coach at Canterbury, my foot will be on my native heath—my name, Micawber!"

All this simply meant that Micawber was going to be clerk to Uriah Heep at Canterbury, for the villain was now the real head of Mr. Wickfield's business, and, with his " 'umble " mother, lived in the house, to the distress of poor Agnes.

DAVID MARRIES DORA AND BEGINS TO WIN FAME AS AN AUTHOR

David was still deeply in love with Miss Dora, and as he was now earning quite a good income by writing, and beginning to win fame as an author, he ventured, with the assistance of Traddles, to propose to the aunts with whom she had gone to live that Dora and he should marry. Before long the aunts gave their consent, and they were married. Dora was still little more than a girl, and she was quite unable to keep house properly. Indeed, she was everything that was charming, except a housewife, and David's home was always in a muddle ; while poor Dora played with her little dog, Jip. He had the most lovable of wives all the same, and his only sorrow was to notice that her health seemed to grow feeble, the brightness of her eyes to fade, as the months wore on. He had grave fears for her ; but his aunt, who had taken a cottage near his own, watched over Dora with as much loving care as if she had been her own daughter.

Meanwhile, things were going badly with Mr. Wickfield, and Agnes was in great distress, when one day the worthy Micawber called, in a very troubled state of mind, to see David and his aunt. On being asked to explain what was the matter, he did so in his own way.

MICAWBER'S GREAT DISCOVERY AND ITS HAPPY RESULTS FOR ALL

" What is the matter ? What is *not* the matter ? Villainy is the matter ; baseness is the matter ; deception, fraud, conspiracy are the matter ; and the name of the whole atrocious mass is—HEEP ! "

He went on at great length to denounce this villain Heep in his own extravagant way, but, to cut his long story short, it all meant that Micawber had discovered the swindling of Uriah Heep, and had set himself to bring honest people to their own. Thanks to him, Miss Trotwood's lost fortune was largely recovered, Mr. Wickfield was restored to happiness, and Mr. Traddles as a young lawyer had a great deal to do in making the old business shipshape again.

Miss Trotwood, out of gratitude for Micawber's service, advanced the money for him and his family to go out and establish themselves in Australia, in the hope that he might find out there the fortune he had vainly expected to " turn up " in England. But the Micawbers did not go alone. In the same boat sailed Mr. Peggotty and Mrs. Gummidge, and with them Emily, whom her uncle still cherished, though she had run away from home and he had to search for her far and wide.

David saw them all sail away, and the night fell darkly on the waters and on him. He next went down to Yarmouth with a letter for Ham, only to be present when the honest young man was drowned in trying to reach a wreck, on which the last man who was washed away was none other than the false friend Steerforth. The shadows were gathering round his own hearth too, for poor Dora gradually faded away, and one day she died peacefully in the arms of Agnes Wickfield.

THE END OF THE LONG STORY AND THE GREAT HAPPINESS THAT CAME AT LAST

David Copperfield, who had known all these sorrows, was still a very young man, with all his life's work before him and his fame as an author steadily growing. He wandered abroad in foreign lands for some years, and when he came back again to England he found his aunt comfortably settled at the old home, with his own old nurse, Peggotty, now a widow, as her companion. Best of all, his spirits began to revive. He found Agnes Wickfield still the same wise, constant woman, and more beautiful than she had been in the dear days when they were young folk together at Canterbury. His aunt managed to show him what he had never before realized, that both he and Agnes loved each other even more than brother and sister, and—so they came to be married !

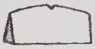
" I have loved you all my life," said Agnes to David when he had declared his love for her. " And I have one thing more to tell you. On the night that Dora died she left me a last charge. It was that only I should occupy this vacant place."

THE NEXT STORY OF BOOKS IS ON PAGE 2975.

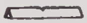
A VIOLIN FROM A CIGAR-BOX

CONTINUED FROM 2812

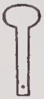
THE easiest musical instrument to play is the one-stringed violin. If we have what is called "a good ear" for music, if, in fact, we can hum, sing, or whistle an air correctly after having heard it once or twice, we shall soon be able to play a one-stringed violin. We need not study music. We need not even be able to read the notes. We shall simply learn by experience where to put our finger on the string of the violin to get any note we require, and in a very short time, perhaps in a day or two, we shall be able to play simple tunes.



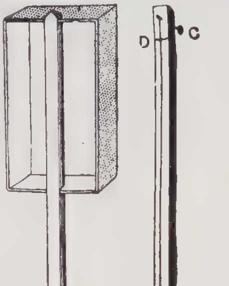
The bridge.



The stop.



The peg.



The picture on the left shows the violin without box-lid and that on the right the complete violin. (A) Cigar-box; (B) bridge; (C) peg; (D) stop.

Occasionally these instruments are to be seen in music shops, but it is so easy to make one that it is really hardly worth while to spend money. We shall make our violin out of a cigar-box. The right size is a box made to hold fifty cigars.

First we must take off all the paper that is stuck round the edges of the box. The easiest way to do this is to scrub it off with a hard nail-brush that has been dipped into boiling water. We must not make the wood wetter than we can help, or it will warp. The lid will now come right off, because it was only the paper that formed the hinge. On this lid we must draw with a pencil the two little figures, something like an S in shape, that are shown in the illustration. We can cut these shapes out with a fret-saw in a few minutes. Let us do it as neatly as we can, for the appearance of our violin depends upon this part being done well.

Now we must get a piece of hard wood about thirty inches long. Walnut or mahogany will do. It should be about three-quarters of an inch wide and half an inch thick. A carpenter will cut a piece to these measurements for a quarter. We should ask him to plane away the sharp edges on one side and leave the others square. Then, when we look at the end of the wood, we shall see that it is shaped like a D; round on one side and flat on the other. Now with a sharp penknife we must cut two notches in the ends of the cigar-box for this piece of wood to fit into. When we have made the notches almost big enough with the knife, we should wrap a piece of sandpaper round the wood that is to fit into them and rub it steadily backwards and forwards in the notches until they are quite smooth. In this way we can fit the wood into them very neatly.

Now glue the wood into the notches, leaving about one inch projecting at one end. Then put a little glue all round the edges of the box and on the wood between the two sides, and fix the lid into its place again. A few tiny brass screws put in carefully round the edge of the lid will make it all quite firm.

Now, about one inch from the end of the long piece of wood, make a hole about one-third of an inch in diameter, and fit into it a small wooden peg shaped like the one shown in the picture.

Your violin is now practically complete. We need only two tiny pieces of some hard wood. One will form what is called the bridge, and the other will be merely a thin strip which is glued close to the peg and is called the "stop." We can cut them out of a boxwood ruler that costs a nickel. The picture shows how they are to be fixed.

Now we must go to a music store and ask for one "A" string for a violin. This will cost ten cents. "A" strings are generally made double the length required for ordinary violins, so they will be just right for ours. We had better tell the shop people that we want a double-length one, uncut, and they will understand. At the same time we can buy a violin bow. New ones can be bought for a dollar, but often music stores have second-hand ones that will be sold for much less, and these are sometimes better than those that have never been used before.

Before we attempt to fix the string we must cut the little piece of wood that projects from the bottom of the violin to a point. Then we must make the box quite smooth with sandpaper and give it a coat of varnish.

When the varnish is quite hard, take the string and make a loop at one end large enough to slip over the projecting point. Then stretch the string to the other end, make a small hole through the peg, and thread the string through it. Now put the "bridge" into its proper place, as shown in the drawing, and make the string tight by turning the peg. When it is tight, draw the bow across it gently, and if it gives out a clear note, our violin is a success.

Now we shall find that it is possible to amuse ourselves for hours trying to play on it, and we shall be surprised to find how quickly we shall learn to slide our finger up and down the string so as to get the notes we want.

In a very few hours we shall have learned to play something, and then we shall improve every day. Probably we should never learn to play an ordinary violin by ourselves; that is why people say it is such a "difficult" instrument. But this kind which has only one string is the easiest instrument to play that has ever been invented.

But, although it is easy to learn, we must not think that it does not sound well. When we have practised for some time we shall be delighted with it. Then we can get somebody to accompany us on the piano, and we shall improve rapidly till we have become quite good violinists.

These one-stringed instruments are often played at public concerts, and some performers become well known for the effects they can produce. Most of them play on cigar-box violins that they have made themselves in the manner here described. It must be explained that this instrument is not held like an ordinary violin. The box part is placed between the knees, the string is fingered with the left hand, and the bow is, of course, held in the fingers of the right hand.

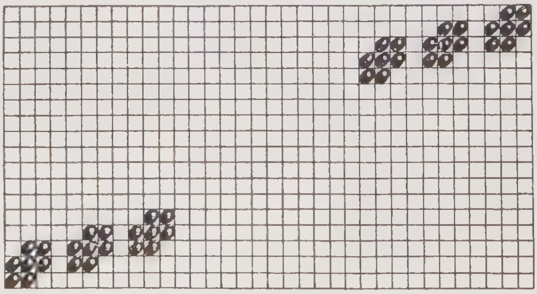
A BEAD BELT THAT ANY GIRL CAN MAKE

THERE are three ways of making a bead belt. We can string the beads together somewhat after the method shown on page 2033, without attaching them to any material; we can make the belt on a loom, which sounds very difficult, but is really a good way and very interesting to do; a third way is to sew the beads on to canvas. As the last of these three is quite easy, we are going to follow that way first, and later on find out not only how to use the bead loom, but how to make one for ourselves.

Now for the materials. We shall need a strip of fine canvas, which may be cut from 1½ inches to 2 inches wide, according to the width of belt desired. The length of the strip must, of course, depend on the measurement of the waist.

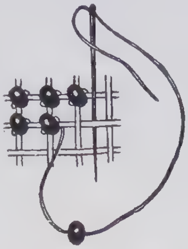
But as we are going to make a particular belt, we decide that it shall measure 21 inches in length and 1½ inches in width. As to the material, Penelope canvas, No. 50, 27 inches wide, is suitable, and a quarter of a yard would make several belts. A fine cream-colored French canvas is also used for beadwork. We shall need a spool of white linen thread, or, better still, some white dental floss. The floss looks better and wears well, provided the beads are good ones and do not cut it. Waxing the thread or floss a little prevents injury. It would never do to have the thread break and the beads drop off the belt. The choice of beads depends much on the pattern to be worked. The opaque Tosca beads would suit our design. They must be evenly formed and of a size to fit the hole or mesh in the canvas. The price is only a few cents a package, and we shall need about six packages of pale blue, one of white, and a few amber crystal beads.

We can buy bead needles by the packet, and we had better try one through the canvas and a bead to see that it is the right size. No. 12 will probably fit. The pretty design which we have chosen for our belt has three white daisies in a row, at intervals of 1 inch between the rows, placed along the edges of the belt, as shown in picture 1. The daisies will go with any shade, therefore the color of the background can match that of the dress with which the belt is to be worn. We will make it pale blue. It is well to cut the canvas about 24 meshes wide, so that three meshes are left for turnings at each edge, and the eighteen meshes between filled with beads. The ends of the canvas must also be cut to allow for turnings; so we make the strip a little longer than 21 inches.



1. The pattern.

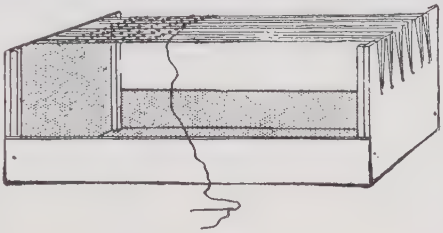
The beads are sewn on to the canvas where the bars cross, and they always lie crosswise on the canvas, or diagonally. We secure the knotted end of the thread or floss on the wrong side of the canvas, beginning at the left bottom corner of one end. To sew on a bead we thread one, pass the needle down into a mesh, pass it behind and under the cross-bar below and bring it through the mesh, as shown in picture 2. Beads are thus sewn on till the end of the row is reached.


2. Sewing on the beads.

As all the beads must slant in the same direction, when we reach the opposite end of the belt we can either turn the canvas upside down and proceed with the next row of beads, which is the simpler way, or we can run the needle along the back of the canvas, and sew the next row of beads under the last one.

We must look carefully at the pattern to find out where to sew the six white beads for the daisy petals and the amber ones for the centres. To avoid possibility of error, it is well to mark with a pencil the position of the daisies on the canvas, so that we shall know where to replace the blue beads with the white and amber ones.

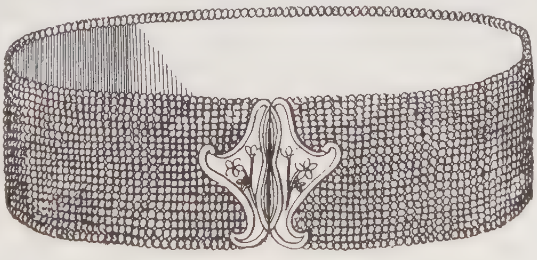
When the beads cover the canvas, we stitch down the turnings and line the belt with sateen to match the blue groundwork beads. Then clasps can be sewn on to the ends. Pretty ones may be had for a very trifling sum.


3. The bead loom.

Small bead-work articles can be made by threading the beads together like a network without using any material for a support, and keeping two needles and threads in use while threading them. The work is then backed to give it a support.

This method is not advisable where a large surface is to be covered. It is somewhat like that of the loom-work now to be described.

A bead loom is not a large machine, but a small and most useful contrivance for making many bead articles. It has long been popular in America, and is getting very well known. We can buy one at a fancy-needlework store in almost all our cities—or we can make one for ourselves out of an oblong wooden cigar-box in the way shown in picture 3. First we take off the lid. Then we cut down the two sides by ruling a line along them one inch from the bottom. After passing a sharp knife several times along the line, the wood will snap off, and the rough edges can be smoothed with sandpaper.


4. The bead belt complete.

The small strips of wood half an inch square seen from the ends, to match the height of the box, are nailed inside the corners to strengthen the ends. Along the tops of the end pieces we cut little notches one-sixteenth of an inch apart. These are to hold the warp threads, which are stretched across the open box and fastened round six little screw-eyes below in the end pieces of the box.

This home-made bead loom will be found useful for all kinds of purposes. A simpler one still can be made by nailing two upright pieces of wood on to a bar, or even by nailing two pieces of perforated cardboard to the wooden frame of a child's slate.

The woof threads should be just two-thirds as coarse as the warp ones. For instance, a warp thread No. 60 would have a woof thread No. 90. A bead needle, size No. 11, and loom beads, about No. 4-0, will be needed.

To make our belt, which, it will be remembered, is eighteen beads wide, we fasten to the loom twenty warp threads about 26 inches long. The two outer ones are to form the edges of the belt.

First we take a needleful of white linen thread and tie it to the left top warp thread, and then thread eighteen beads on to it, according to the pattern.

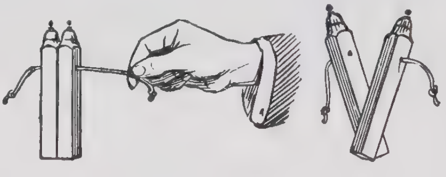
Now comes the important thing in bead loom-work. We carry the needle with the string of beads *under* the warp thread, so that when the fingers press the beads upward from underneath, they come up through the spaces between the warp threads. To keep them in place we pass the needle through the beads from right to left *over* the warp threads this time. The row of beads is now secure. We proceed with the other rows, picking up the blue, white, or amber beads according to pattern. The woof thread is fastened off by passing it through two or three rows of beads. Having made the belt the desired length, we gather the warp threads into four bundles of five each and tie these up close to the beads. They can be stitched on to a piece of silk or other material, and clasps attached to the two ends of this. The daisies will look best done on bead-work done with the loom, because the beads are placed perpendicularly in threading them, not diagonally, as they are in canvas-work.

Neat little serviette rings are made with canvas bead-work.

Many of the designs of the American Indian women are both quaint and beautiful, and their pretty patterns are worth imitating.

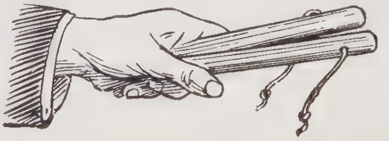
THE PILLARS OF SOLOMON

If the young reader has the good fortune to possess a box of conjuring tricks, we may be pretty sure that one of the items is that known by the imposing title of "The Pillars of Solomon." This consists of two square pieces of mahogany, four inches long, laid side by side as shown in our first picture, with a piece of string running backwards and forwards through a hole near one end of each. There is a knot at each end of the string, and when the cord on either side is pulled, that on the opposite side shortens accordingly. So far, there is nothing surprising. But presently the exhibitor of the trick passes the blade of a knife between the two "pillars." To all appearance the string is thereby cut in halves, and he proves that it is so by moving the pillars slightly apart as in the second picture, and showing the cut ends. And yet, when he brings the pillars back to their original position, one against the other, the string has somehow become one again, and can be pulled backwards and forwards as freely as ever it was before it was apparently cut.


1. The pillars of Solomon. 2.

There is, however, a weak point. The two pillars are pivoted together at the bottom, so that they cannot be separated, and a sharp looker-on soon guesses the secret, which is that the string, instead of passing straight through from side to side as it appears to do, goes down the one pillar and up the other. The supposed cut ends, as shown in the second picture, are mere make-believes, short bits of string artfully glued into the wood.

If the reader has ever been in the East, and visited India, he may have seen the same trick performed by the Indian conjurers, but in a much more surprising way. The "pillars" are in this case two sticks of bamboo. There is here no pretence of cutting the string, but after the conjurer has pulled it backwards and forwards two or three times with the sticks held side by side, he does the same thing with their outer ends held some inches apart. But the sticks are still held together at the bottom, and some clever person is pretty sure to say to his friends, "I know how that's done! The string goes from the one stick to the other at the bottom; you will see that he can't separate them." And he looks round at the company with a superior smile. But the conjurer smiles too, and holds the sticks wide apart, one in each hand. And yet, when he puts them together again, the string is drawn backwards and forwards, as before.


3. An improvement on the pillars of Solomon.

Now, this is really an excellent trick, and it has the additional recommendation that the young conjurer can easily manufacture the needful apparatus for himself. For the "pillars" he must get a couple of straight pieces of elder, about seven or eight inches long and three-quarters of an inch thick. From these he must push out the pith, as if he were going to make pop-guns of them. He must then, with a stout brad-awl, make a little hole through one side of each, about an inch away from what we will call the upper end. Through each of these holes he must pass a thin cord, and, with the help of a piece of wire bent into a hook, draw it down the stick and out at the opposite end. A tiny weight must now be attached to this end of the cord. An easy way to do this is to roll a bit of tinfoil into a hard ball, about half an inch in diameter, make a hole through it, pass the cord through the hole, and make a knot on the under side. A little bit of brass tubing, or a bullet with a hole through it, as sometimes used by fishermen, may be used instead of the tinfoil ball, if more easily obtainable, the test of all being, as it should be, that, if you hold the stick upright, draw the cord up as far as it will go, and then release it, the weight will draw it gently down again.

Having thus weighted one end of the string, you must draw up the opposite end as far as it will go, cut off all but six inches of it, and make another knot on the free end.

There is no real necessity to close the ends of the stick, but you may improve their appearance by pressing a cork into each and finishing off with a little red sealing-wax.

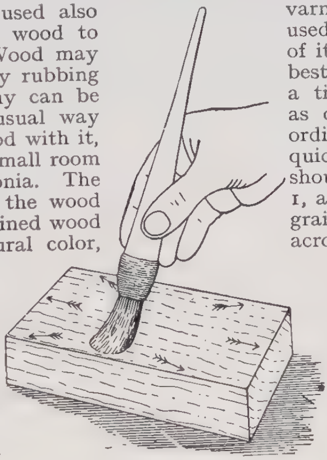
To show the trick, hold the two sticks horizontally in the left hand, as shown in our third picture. The cord in the stick to the left must be drawn out to its fullest extent, but the weight in the other stick must have been previously allowed to run down to the bottom, drawing down the cord and leaving only the upper knot visible. Now slowly pull out the cord on the right, at the same time slightly elevating the upper ends of the two sticks, when the cord in the opposite stick will naturally be shortened, the little weight drawing it down inside. Lower the sticks again to the horizontal position, pass them into the opposite hand, and proceed as before, pulling the left-hand cord and letting the right-hand cord retire into the stick.

This is the whole of the secret. To cause either cord to shorten, you have merely to tilt the stick so as to make the little weight within it run down into the stick. To lengthen the other cord, you must draw it out with the fingers. But the two movements must be made simultaneously, and it is in the neatness with which they are combined that the magic of the feat consists.

STAINING AND POLISHING WOOD

WOODWORK is stained to improve its natural color. The difference between stain and paint is that stain sinks into the fibres of the wood, and colors or dyes them, but leaves the grain of the wood showing as plainly as before, so that you can still quite easily see what wood it is. Paint forms an opaque coat on the surface which quite conceals the material beneath. Generally stain is used to make a cheap wood look like an expensive one. The colors used are chiefly imitations of walnut, mahogany, rosewood, and other woods. These stains are used on lighter colored common woods, such as common whitewood, pine, and deal, and only for good appearance and not to deceive people, for anyone with a little experience can tell what the wood really is.

Sometimes, though not often, colors quite different from that of any wood, such as green, blue, or red, are used as stains. Very often fancy woods are darkened and improved in appearance by stains of the same color as themselves. Stain is used also to darken lighter parts of the wood to the same shade as the rest. Wood may be darkened in color slightly by rubbing oil into it. Oak and mahogany can be darkened by ammonia. The usual way to do this is not to wet the wood with it, but to shut it up in a case or small room with saucers of liquid ammonia. The fumes of the ammonia darken the wood in a few hours. In all cases stained wood must be darker than the natural color, for a dark surface will show through a lighter stain.



1. How to varnish wood.

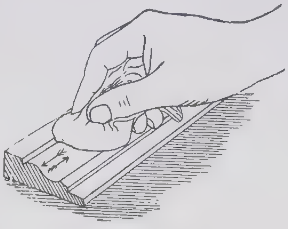
Stains for wood are sold ready for use in small bottles by all dealers. They may be put on with a brush, or rubbed in with a rag. The neater way is to use a brush. Generally two coats are given. With only one coat it is not easy to keep the same shade of color all over, for any overlap with the brush in applying the first coat shows darker than parts over which the brush has passed only once. In succeeding coats this becomes less and less noticeable, so that the best result can be obtained by using weak stain and applying a number of coats, never putting on the next coat until the previous one has become quite dry. The surface must be smoothed with sandpaper before the first coat and after each coat has thoroughly dried. Otherwise it will feel and look rough, for anything which wets the wood causes its surface to roughen as it dries. Varnish stains are often used instead of simple stain. These are varnish and stain combined, and save the trouble of staining and varnishing separately. If done separately, it is necessary that the wood should be stained before it is varnished.

VARNISH. Varnish does not conceal the character of the wood beneath it, for it is almost transparent unless something is added to color it. It simply produces, when dry, a hard, glossy film on the surface, which protects the wood from the effects of dampness and from becoming discolored by dirt. Quick-drying varnish consists of shellac dissolved in methylated spirit. The spirit evaporates and leaves a thin layer of shellac on the surface of the wood. Shellac varnish is used only for indoor work. In making varnish for work exposed to the weather it is necessary to use linseed oil instead of spirit, and copal, mastic, amber, or dammar in place of shellac. Varnish may be used either on the bare wood or on paint.

Varnish is applied with a brush. Two or three coats are put on, each being allowed to dry and then smoothed with fine glasspaper before applying the next. For large surfaces a large brush should be used, so that the varnish can be spread quickly. For small work a small brush is better. The varnish should be put on uniformly, so that some parts shall not be more thickly coated than others. Varnish should not be allowed to run over edges or corners of the article being varnished, and the brush should be used so that it does not leave marks of its own all over the work. The best way is to take one surface at a time and cover it with varnish as quickly as possible—that is, if ordinary shellac varnish, which dries quickly, is being used. The brush should be held as shown in picture 1, and should move in line with the grain of the wood. If it is used across the grain, marks of the brush will show more distinctly. To prevent varnish from getting squeezed out of the brush and running over the edges of the wood, the brush should always move outwards to the edges, as indicated by the arrows in picture 1. In approaching the ends of the wood it goes directly to the edges, but in passing along the sides its direction is only very slightly diagonal towards the edges there, so that the movement shall be as nearly as possible in line with the grain. Spirit varnish dries in a few minutes, but to obtain the best results each coat should be allowed several hours to harden before sandpapering it down for the next. After the first coat, old sandpaper which has already been worn smooth by previous use should be employed, and after the final coat the work should not be rubbed down at all. Sandpaper should always be rubbed in line with the grain of the wood. If rubbed across, it scratches the surface too much.

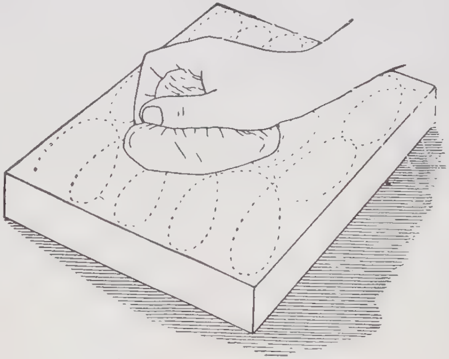
POLISH. The difference between polishing and varnishing is chiefly in the method of application, for shellac varnish and polish are practically the same thing.

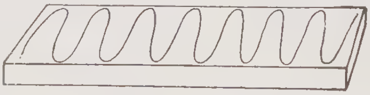
The distinction between varnishing and polishing is that varnishing is done with a *brush*, and polishing with a *rag*. Polishing requires more skill and time, but it gives a smoother and glossier surface than varnishing. It is important in polishing that the pores of the wood shall first be thoroughly filled, so that the polish cannot sink in and lose its lustre. A number of applications of polish with long intervals for drying will do this, but it is quicker and cheaper to fill the pores with some other substance before beginning to polish. The filler is generally whiting or plaster of Paris dissolved in water, turpentine, or oil, and colored to match the wood. It is rubbed in and allowed to dry, and then the surface is sandpapered smoothly. The wood is now ready to receive the first application of polish.


2. Polishing.

The rag used in polishing is called a *rubber*. It should be a piece of soft white linen. This is used as an outer covering to a pad of cotton-wool.

The cotton-wool is moistened with polish, and the single thickness of rag encloses it and is drawn up like a pudding-cloth at the top and grasped by the hand while it is used. Picture 2 shows a small rubber held in this way by the thumb and fingers only. Picture 3 shows a larger one. The pressure on the rubber should not be heavy, and a few drops of linseed oil are put on the rag to make it move about freely without tendency to stick. The polish is put on the cotton-wool only, and gets squeezed through the rag in rubbing. The method of rubbing depends to some extent on the shape and size of the work. First, it is necessary to cover the surface of the wood with polish as quickly as possible. This is done by moving the rubber in large sweeps either with or across the grain, or both. The direction is not important as long as the polish is rubbed uniformly all over the surface. On a molding, as in picture 2, the movement would be entirely backward and forward lengthwise. On a large flat surface, as in picture 3, the rubber may be moved in curves or spirals, as shown by the dotted lines. These are only drawn as lines, but the broad surface of the rubber would, in following them, polish the entire area of the wood. On a long surface of moderate width the first movements of the rubber might be as shown in picture 4. For getting into the corners of panels and similar parts the rubber must be squeezed into a pointed form which will reach those parts. After the polish has been applied in this manner, the work must be laid aside for at least a day. Then a second application is given in the same way as the first.


3. Polishing a larger surface.


4. Polishing a long surface.

In the best work this process is repeated a third time or even a fourth, and long periods are allowed between each to allow the polish to sink in as much as it will.

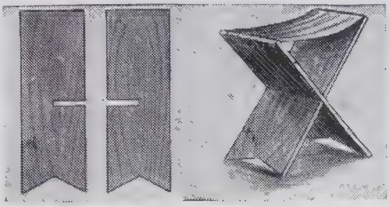
In sinking in, and hardening, it generally loses some of its gloss, and as long as this occurs the work can be improved by fresh applications of polish. This is called *bodying in*. There is now only the final process, which is called *spiriting off*. In spiriting off, the rubber is moistened with wood alcohol instead of polish, and is rubbed lightly over the surface to remove smears caused by the rubber in bodying in, and also to take up the oil, which, when present, gives the surface a dull, greasy appearance. The last movements of the rubber should follow the grain of the wood—that is, the rubber should move in straight lines with the grain, and not across or in curves.

LACQUER. This is used chiefly for coating polished metal to prevent rust. It is more generally used on brass than on any other metal. Brass does not rust, but soon turns dark and dull if unprotected by lacquer. Before applying lacquer the surface of the metal should be made as bright as possible. When the surface is not bright it is because it has a lot of little depressions and lumps, too small to be seen, but their effect is to refract the light in many different directions. When a surface is absolutely smooth all its parts receive and reflect the light in the same direction, and a shiny appearance is the result.

This shiny appearance can be preserved for a long time by protecting the metal with lacquer. In time the lacquer wears off from the parts of an article that are constantly handled, or in the course of years it becomes pitted and cracked by the action of the air, which eventually gets at the metal beneath. Until this happens the metal remains as bright as when the lacquer was put on. Lacquer is sold in small bottles and is applied with a camelhair brush. It may be obtained either colorless or colored. It is sold in all the primary colors, and these can be varied by mixing. The remarks about the use of the brush in varnishing apply to lacquering also, but in lacquering extra care must be taken to put it on free from dust and air-bubbles, for these allow the air to get at the metal.

When the heating of the metal was a necessary part of the process, lacquering was attended with considerable difficulty, but new and improved methods have made it quite a simple matter. Formerly the lacquers used were practically the same as the varnish which we use on wood, but they are now of a metallic character and are very much better adapted for their purpose.

A PORTABLE STOOL THAT A BOY CAN MAKE



ANY boy can make a simple camp-chair out of two pieces of wood and a small strip of canvas or carpet.

The wood should be ordinary planking, about half an inch thick, twenty-four or twenty-six inches long, and of a suitable width. Half-way up each piece we cut a rectangular slot, as shown in the picture, using for this purpose a sharp saw and a chisel, or a fret-saw. Then, at the bottom of each piece of wood, we saw out a wedge-shaped piece, so as to leave feet upon which the chair or stool can stand securely.

We provide the seat by nailing the canvas or carpet to the wood. The material should be about twelve inches long, and one end is nailed to the top of one piece of wood, and the other end to the other chair-leg. In doing this it is well to turn in the edge of the canvas, and to use large-headed nails. The chair is now ready for use. All that we need do to set it up firmly on the ground is to fit the two slots to one another, allowing the legs to open as wide as the canvas or carpet will allow them.

The wood may be stained or colored, and the camp-stool would make quite a nice present. In order that it may look neat when finished, it is important that the slots should be sawn at a point exactly half-way up the pieces of wood, and that they should extend half-way through the width of the planking. Then, when the two legs are fitted together, each will fit exactly into the other. For folding up, the legs are disengaged and placed side by side.

ANSWERS TO THE GAME OF "WHAT-IS-ITS-NAME?"

ON page 2812 are some descriptions of animals, and we have to guess their names from the descriptions that are given.

These are the names of the different creatures:

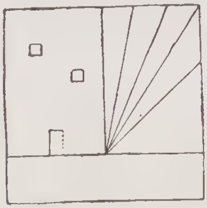
1. Spider.
2. Tortoise.
3. Giraffe.
4. Amœba.
5. Bat.
6. Porpoise.

THE SOLUTION TO THE PUZZLE OF THE SECRET LOCK

WE read on page 2806 how a rich man, who wished to preserve his valuable vessels safely, made a safe and fastened it securely with a lock which would only open when three pointers on three dials pointed to three different letters which formed an English word. Knowing this, we thought that it might be possible to find out the word, and this is the way the word can be thought out.

Every English word must have at least one vowel, or otherwise we could not pronounce it. When we look at the dials we find that the only vowel that appears on them is the letter Y, and therefore we know that this letter comes into our word. No English word begins with a Y and has the two following letters consonants. Also, all the words of three letters which begin with two consonants either begin with an S or have H, L, or R as their second letter. But these four consonants do not appear on the dials. Therefore, Y must be the middle letter of our word, and going very carefully through the consonants on both dials and placing them before and after Y, the only word which is made is "pyx," which is the name of a little vessel used for religious purposes.

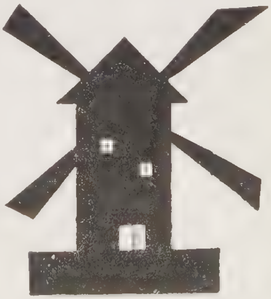
A WINDMILL FROM A SQUARE OF PAPER



1. The paper marked ready for cutting.

WE can make an excellent picture of a windmill, with its sails all set, like the one shown on this page, by simply cutting up a square of black paper into ten pieces and pasting them down upon a sheet of cardboard.

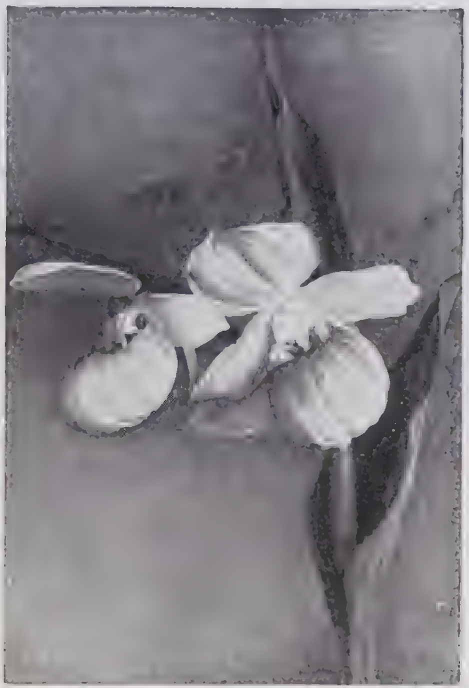
We take a piece of black paper such as may be bought at any stationer's shop, measure off a square, and, placing it upon the table with the white side uppermost, rule pencil-lines upon it, like those shown in the first picture. Then, with a sharp penknife, cut the paper up into ten pieces as marked, and paste these down upon the cardboard in the positions shown. The windows and door are made by pasting the little pieces of paper of which they are formed upon the cardboard, putting the white surface uppermost, and the bars of the window and the panels of the door may be drawn in with pencil. In this way every piece of paper is used up, and we have quite a good picture of a windmill.



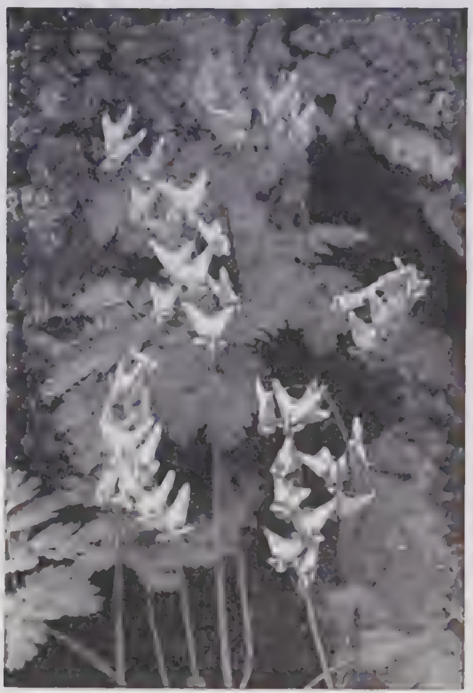
2. The windmill completed.

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 2993.

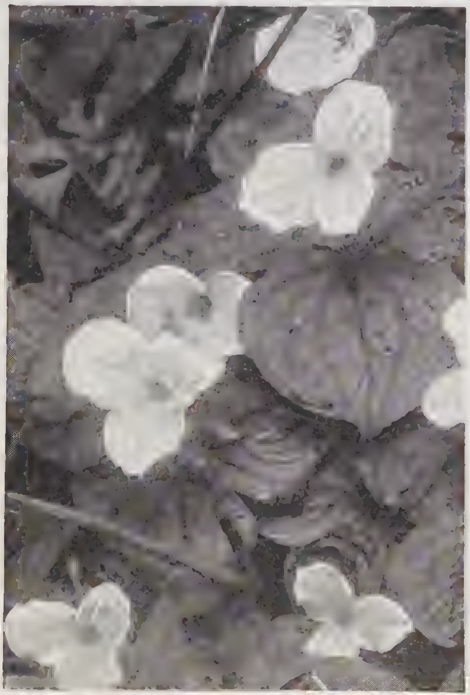
CANADIAN FLOWERS



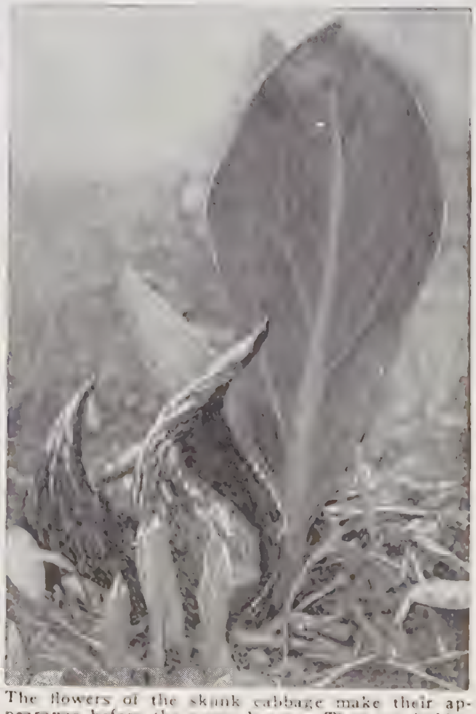
The showy cypripedium is by many thought to be the most beautiful of the lady's slippers. Its large, white flowers bloom in June and July.



Dutchman's breeches is an April flower. Its lovely heart-shaped white and yellow flowers spring from clefts in rocky cliffs. It has thrice compound leaves.



The large white trillium shown in this picture is the most beautiful of the trillium family. It fills the northern woods with its starry white blossoms in May. Farther south the blossoms come earlier.



The flowers of the skunk cabbage make their appearance before the green leaves. They are hidden by a purplish spathe that curls round them. The plant has an unpleasant odor which gives it its name.

WHAT THIS STORY TELLS US

FEW countries have more wild flowers than Canada, as over four thousand have been identified. So this article can tell you of only a few of them, but among these are some of the most beautiful. They grow in the woods, along the roadside by the streams, in the marshes, and in the open fields. Some of these which grow in the fields, though beautiful, have become pests which the farmer would like to see destroyed. Perhaps we shall be able to give you an article on these "weeds," so-called, for often a weed is only a flower out of place. Dr. Hamilton has told the story of the flowers so well that you will be able to name many that you find on your rambles round the country-side.

WILD FLOWERS OF CANADA

PART I

CONTINUED FROM 2785

"FLOWER in the crannied wall,
I pluck you out of the crannies,
Hold you here, root and all, in my hand,
Little flower, but if I could understand
What you are, root and all, and all in all,
I should know what god and man is."
— Tennyson.

Spring begins, says Burroughs, "when the partridge drums, when the hyla peeps, when the shad starts up the rivers and the grass greens in the spring runs; and it ends when the leaves are unfolding and the last snowflake dissolves in mid air."

Nearly four thousand flowering plants have been found in Canada. Of those, only the most common ones will be described. Fortunately plants occur in families and show striking family characteristics. This helps us much in our desire to know by name our floral neighbors.

LOOK UP FOR THE FIRST FLOWERS TO THE FOREST TREES

In the spring the motto of all flower-lovers should be, "Look thou not down, but up," for the trees are the first to present their flowers. Long before the snow has disappeared, the "pussies" on the willows have burst their purplish-brown winter jackets and presented their velvety gray catkins, which form a charming contrast to the reddish twigs. Some gray catkins become yellow, and bear the pollen, which is carried to the silvery-green pistillate catkins by wind and insects. The pistillate catkins remain after the leaves of the tree have unfolded, and ripen their seeds, which are carried away by wind.

The Poplars belong to the Willow family, and, like the Willows, send out gray, downy tassels before the leaves open. Birches also bear catkins, which appear in the early spring. Birch catkins are very pretty. They are long, graceful, of a silky softness, and with a rich golden color.

THE RED BLOSSOMS OF CANADA'S OWN MAPLE-TREE

Most Maples blossom early. Even in April, the Red Maple is covered with tiny red blossoms. These, with the red twigs, give the tree a striking appearance, in contrast with the white snow which may not have disappeared. The Silver Maple has yellow flowers, and the Rock or Sugar Maple, the national tree of Canada, sends out greenish-yellow flowers, on slender hairy stalks, in graceful, drooping clusters, appearing a short time after the leaves have unfolded. The Basswood or American Linden blossoms in May. Its fragrant, honey-bearing flowers appear in clusters, hanging from the centre of a narrow, leaf-like bract. This bract later serves as a float to the round, one-seeded fruit.

The Elm is a popular tree in Canada. It grows to a great height, with

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drooping branches, and in general shape is like an inverted cone. For lining streets, and to lend grace to any landscape, it is one of the most charming of our trees. Before the leaves have opened, the flowers, on slender, drooping stalks, fringe the sides of every branch. The fruit is one-seeded, and surrounded by a thin wing, which serves as a float. The fruits drop early, and in June can be gathered in great quantities.

SOME OTHER FLOWERS OF THE FOREST

The Oaks, Beeches and Chestnuts also blossom early. The Horse Chestnut, though not so common as oaks and beeches, has beautiful flowers, which appear during the latter part of May. In winter, each twig ends in a bud one inch or more long, and within the scales of this bud are borne the leaves and flowers of the coming year. When the warmer days of spring come, the resinous scales of the bud drop off and the leaves—tiny, downy, green babies, done up in woolly blankets—appear.

> "The Gray Hoss-Chestnut's leetle hands unfold,
> Softer'n a baby's be, at three days old."

The white flowers are very attractive, and appear in large, erect clusters, resembling the flower cluster of the common lilac. The native broad-leaved trees of Canada are most beautiful in midsummer, and particularly in their autumn tints of yellow and red, but the charm in early spring is great when

> "The saffern swarms swing off from all the willows,
> So plumb they look like yaller caterpillars."

THE FIRST FLOWERS OF THE EARLY SPRINGTIME

If one is bold enough to venture into swampy places in the leafless woods in March, he may find the purple-mottled, sharply-pointed spathes of the Skunk Cabbage. The young buds pushed their way upward before the winter set in, and Thoreau advises those afflicted with melancholy to go to the swamps and see the brave spears of Skunk Cabbage already advanced toward a new year. The purplish shell-like leaf that curls about the tiny flowers, which are hidden from view, is not attractive, and the whole plant, as its name implies, possesses an unpleasant odor, so that while we admire its bravery, we shall not be inclined to gather it. The large beet-shaped leaves, which grow to a length of from one to two feet, appear later than the spathe and flowers, and help to mark the wet woods with bright patches of rich foliage. It seems that bears greatly relish this early green, and settlers near Philadelphia gave to the plant the name "bear-weed." One writer remarks that "it must have been a hot morsel, as the juice is acrid, and is said to possess some narcotic power, while that of the root, when chewed, causes the eyesight to grow dim."

THE SWEET-SCENTED TRAILING ARBUTUS, OR MAYFLOWER

Much unlike the Skunk Cabbage, in April or early May the sweet-scented, rosy-lipped Mayflower or Trailing Arbutus appears locally amongst damp and withered leaves, in sheltered hollows, under trees or in little dells. It has been described as:

> "Pink, small and punctual,
> Aromatic, low."

The stem has rusty hairs, and is prostrate or trailing. The leaves are rounded, heart-shaped at the base and evergreen. The fragrant, pink, waxy flowers are hidden in little clusters beneath the leaves. Because of their delicious fragrance and rich store of honey, the flowers are much sought after by both man and bees. It is claimed that the Mayflower was the first flower to greet the Pilgrims at Plymouth after their fearful winter, and give them a promise of better days to come. Whittier says:

> "Yet God be praised! the Pilgrim said
> Who saw the blossoms peer
> Above the brown leaves, dry and dead,
> Behold our Mayflower here!"

OTHER FLOWERS WHICH GLADDEN THE EARLY SPRING DAYS

Coltsfoot is found in April. It is an immigrant from Europe, but is now wild in this country. It has a slender, scaly scape 3 to 18 inches high, which bears a solitary yellow flower-head, that somewhat resembles a dandelion. It has both ray and disk flowers. The leaves appear later than the flowers, are heart-shaped below, lobed and woolly beneath. It is found growing in most ditches and along the banks or in the beds of streams, where the bees seek it out for the honey from its flowers.

> "Soon after the late snow has melted
> The Liver-leaf puts forth her sister blooms
> Of faintest blue —"

In the woods in early May we may find the fragile-looking, emerald-like flowers of Liver-leaf, more commonly called Hepatica. The flowers are white, pink or blue, and less than one inch broad. Each flower is borne on a fuzzy scape. The leaves are rounded and three-lobed, and the rusty-brown leaves of the previous summer remain over winter, and afford a pleasing background for the delicate flowers.

In April or May we look for the Spring Beauty, which, like Hepatica, opens in the sun and closes in the shade.

> "So bashful when I spied her,
> So pretty, so ashamed!
> So hidden in her leaflets
> Lest anybody find."

Though not much "hidden in her leaflets," the flowers of Spring Beauty, which is also called Claytonia, are very pretty. They are white with pink veins, or pink with deeper colored veins, and grow in a loose cluster. Deep down beneath the ground is a small, round swollen stem or tuber, which in early spring develops into a long, slender aerial stem bearing two grass-like leaves opposite to one another. At the top is the loose cluster of flowers. It is found in moist, open woods of Canada and the United States.

BLOODROOT, WHICH THE INDIANS USED TO PAINT THEIR FACES

In April, the curled-up leaf of Bloodroot, wrapped in papery bracts, pushes its firm tip through the brown leaves, and soon presents a white or rose-tinted flower borne on a naked scape. The foliage leaves are round and deeply lobed. The flowers are beautiful, but the snowy petals quickly fall from about their golden centre, and in two or three days the loveliness of the flower is gone. The plant receives its name because of the crimson juice of its rootstock. The red liquid which oozes from the wounded stem when the flower is picked, stains the fingers. The crimson juice was much prized by the Indians for use in decorating their faces and tomahawks, and in some places it was called Red Indian Paint. The plant grows in Eastern Canada. It is a member of the poppy family.

Dutchman's Breeches has thrice-compound leaves, and white and yellow flowers growing in a raceme on a slender scape. Each flower is heart-shaped, with two bracts or small leaves near its base, two scape-like sepals, four somewhat cohering white petals tipped with yellow, and six stamens in two groups. The two outer petals are large, with spreading tips and deep spurs; the two inner are small, with spoon-shaped tips uniting over the anthers and stigma. The underground stem consists of little tubers collected into one mass, which resembles a bulb.

THE PRETTY YELLOW SQUIRREL CORN

Squirrel Corn very much resembles Dutchman's Breeches. Its underground stems bear scattered yellow tubers resembling grains of corn. Its graceful clusters of nodding flowers have the fragrance of hyacinths. Both are found in rich woods.

In April, the seams of rocky cliffs and hillsides begin to whiten with the blossoms of Early Saxifrage. The leaves are clustered at the root. On a scape 4-9 inch high are borne the small, white flowers in clusters. The calyx is five-cleft, and the corolla has five petals, and there are ten stamens. When ripe, the seed-pods have a rich, madder-brown tone, which gives a warm color to the rocky slopes on which the plants grow.

Our seasons vary from year to year, but usually the same flowers are found in blossom at the same time. When you find the Liverwort, you may look for the Bloodroot and the Adder's Tongue, the Trillium, and soon the Spring Beauty, the Anemones, and the Violets. In many places the blue violets cover the ground with a sheet of dainty violet tinge.

A BEAUTIFUL FLOWER WITH TWO UGLY NAMES

The Yellow Adder's Tongue, a member of the Lily family, though often called the Dog-tooth Violet, sends up a one-flowered scape six to nine inches high. Surrounding the scape at its base are two oblong lance-shaped leaves, which are pale-green, mottled with purple and white. The nodding flower, with a perianth of six pale-yellow parts marked with purple, resembles a small lily. The two names which the plant bears are inappropriate. Mr. Burroughs has suggested "Fawn Lily" or "Trout Lily"—the first name because the two mottled leaves stand up with the erect, startled look of a fawn's ears; the second because of its speckled foliage, and because it appears when the fever for trout fishing seizes many people. It grows in those hollows in the woods, where the early May sunlight filters through the still, leafless branches of the budding trees.

THE WIND-FLOWERS OF THE MAY TIME

Bryant writes:

> ". . . Within the woods,
> Whose young and half transparent leaves
> scarce cast
> A shade, gay circles of anemones
> Danced on their stalks."

And Whittier tells how these

> ". . . wind-flowers sway
> Against the throbbing heart of May."

The Wood Anemone or Wind-flower has a simple, slender stem, three petioled leaves, each with three wedge-shaped leaflets, and a solitary white, pink or purplish flower of four to seven petal-like sepals. Our Wind-flower seems to us an emblem of spring and purity; but to the ancient Persians it was an emblem of sickness, because it was believed that the wind which had passed over a field of anemones was poisoned, and that disease followed in its wake. The Rue Anemone has leaves with rounded leaflets and white or pinkish clustered flowers. The two anemones blossom at the same time, but the Rue Anemone lingers after the Wood Anemone has gone.

THE GAY TRILLIUMS WHICH ADORN THE WOODS

The Trilliums are among the most attractive May flowers. There are three common ones, the White, the Purple and the Painted. The large White Trillium or Wake-robin is without a rival in purity and abundance. It fills rich woods in Eastern Canada, and lends a distinctive charm to the landscape, as its great white stars stand out from shaded wood borders or from the banks of swift-flowing streams. From a stout rootstock arises a stem bearing a whorl of three green leaves. The flower is terminal, and has a calyx of three green sepals, a corolla of three long pointed white petals, six stamens, and a pistil of three stigmas. The ripened fruit is a dark purple berry, ovate and somewhat angled. The flower is beautiful, but without perfume or nectar. Unhappily these beautiful flowers have almost been exterminated in some sections of the country, particularly near large towns. Careless hands pull up the plants, without a thought of seed or root for the flowers of coming years.

The Painted Trillium is not so large and showy. Its three white petals are painted at their base with red stripes. The so-called Purple Trillium has a stout stem, with a whorl of three broadly ovate leaves a short distance below the solitary terminal flower. The calyx consists of three green spreading sepals, and the corolla of three large, lance-shaped, pinkish petals. It is a hardy harbinger of spring, but the name Wake-robin which it receives is not appropriate, because the robins have usually been about and on the alert several days before our flower unfurls its crimson signal.

VIOLETS, BLUE, PURPLE, WHITE AND YELLOW

Among the most popular of all spring flowers are the Violets, in yellow, white and blue. Over twenty species have been observed in Canada, and they are found flooding the swamps, fringing the hills and lurking in shady nooks on the hillside, from Atlantic to Pacific. The common Blue Violet, with its slender, one-flowered scape, its heart-shaped leaves, and its pale blue to deep-purple flower, is perhaps the best known and the most beloved of all. The five petals of the corolla are somewhat irregular, and the lower one is spurred at the base.

> ". . . purple violets lurk,
> With all the lovely children of the shade."

There are many species of Blue Violets. An interesting feature in connection with violets is that many of them have hidden flowers where self-fertilization takes place, and the seeds are ripened in the dark near or beneath the ground. One species is called the Canada Violet. It has white petals veined with purple and violet beneath. Its delicate flowers are fragrant, and it is among the loveliest of the family. The Sweet White Violet, the most fragrant of the violets, has

SPRING FLOWERS OF NORTHERN WOODS

The hepatica is one of the best known of our spring flowers, and one of those that the children love best. It blooms in our Northern woods in early May.

The adder's tongue, which also blooms in early May, is a member of the lily family. Its tall, lily-like flower is pale yellow marked with purple.

The bloodroot gets its name from the crimson juice of its rootstock. It is also called Indian paint, because the Indians used the root juice to paint their faces. The flowers are white or rose-tinted.

The bellwort is another member of the lily family. The leaves of the plant clasp its graceful, curving stem, and under them hang the pale yellow drooping flowers. It flowers abundantly in the spring woods.

small white flowers daintily veined with brownish-purple, and is found in low, wet woods. The Downy Yellow Violet has an erect leafy stem, broadly heart-shaped, toothed leaves, and yellow flowers veined with purple.

> "The yellow violet's modest bell
> Peeps from the last year's leaves below."

In late April and early May our wet meadows are brightened by the golden-yellow flowers of the Marsh Marigold. This name was given it because the early English settlers in America thought it identical with Shakespeare's "Mary-buds."

> "And winking Mary-buds began to ope their golden eyes."

Others, dreaming of home, called it "Cowslip," and that name still clings to it. The leaves are rounded and somewhat kidney-shaped, with several growing from the base of the stem, which is furrowed and hollow, and bears above several flowers which have no corolla. The flower is made up of from five to nine golden-yellow, petal-like sepals, with numerous stamens, and five to ten pistils, which ripen into little seed-pods. The flower produces much pollen and an abundance of honey, and is, therefore, much visited by bees. It is common in all parts of Canada, and it is said to be so abundant along certain English rivers as to cause the ground to look as though paved with gold.

TWO FLOWERS WHICH HAVE BITTER ROOTS

Another dweller in marshy land is Jack-in-the-pulpit or Indian Turnip. There are generally two leaves or long petioles, and each is divided into three leaflets. Terminating a scape is a hood-like leaf or spathe, the pulpit, which is light-green, veined with a deeper tint and stained with purple. Inside the spathe are the small, inconspicuous flowers packed about the lower part of a fleshy spike. The flowers are without calyx or corolla and are of two kinds, the one composed of several united anthers, the other of a single pistil with a bush-like stigma. The two kinds of flowers may be on the same spadix or on different ones. If on the same spadix, the pistillate flowers are at the base and ripen into bright scarlet berries packed upon the spadix. The Indians boiled these scarlet berries and ate them with great relish. Later they discovered that the fleshy bulb-like base of the stem, called a corm, in which is stored the food for next year, lost its stinging taste when cooked, and made nutritious food—hence the name, Indian Turnip. It is a favorite school-boy trick to tempt others to bite into the raw, blistering corm. The impression made on the tongue is not soon removed, and the second bite is not often taken. It is a cousin of the Skunk Cabbage and Sweet Flag, and the Taro Root of the Pacific Islands also belongs to the same family.

The underground stem (rootstock) of Wild Ginger, which sends up its shy, dull purplish-brown solitary flowers in May, has a ginger-like flavor, and by the early settlers was considered a remedy for headache and deafness. It sends up one or two kidney or heart-shaped fuzzy leaves on long stalks, and the tiny flower lies close to the ground on a short stem from the fork of the leaves.

BELLWORT AND STAR FLOWER

Bellwort, a member of the Lily family, is very abundant in the woods in early spring. It has a graceful, curving stem about eight inches high, several lance-oblong, pale leaves set close to or clasping the skin, and beneath the leaves one or two modest, lily-like, yellowish or straw-colored, drooping flowers. It is common in Eastern Canada.

Much resembling the Anemone, but belonging to a different family, is the Star Flower or the Star Anemone. It has a slender, erect stem, bearing at the summit a whorl of from five to ten thin, pointed leaves; and above the whorl of leaves, borne on a short petiole, is a white, delicate star-shaped flower with seven divisions. The whole effect of plant, leaf and blossom, is starry and pointed. The flower secretes no honey, but it is visited by small bees searching for pollen, which is thus transferred from one flower to another and cross-fertilization is brought about.

GOLD-THREAD, A FLOWER OF THE BOG LANDS

A beautiful little plant, whose shining, three-parted, evergreen leaves carpet Canadian bogs throughout the year, is the Gold-thread, which has received its name because of its golden-yellow, thread-like roots. Its delicate white flowers, with their five to seven club-shaped petals, and numerous stamens, are solitary on slender scapes three to five inches high. The pistil consists of three to seven parts, which ripen into divergent pods, borne on slender stalks, and bearing long, tapering styles. Goldthread is one of the best-known of Canadian wild flowers because of its beauties and its uses. A wash from its bitter, yellow roots is used for ulcerated throats; and the plant is regarded by some people as an excellent tonic. The Indians used the roots to make a yellow dye for their clothes and paint for their faces.

BERRIES, WHICH ARE AS ORNAMENTAL AS FLOWERS

White Baneberry is a common plant in cool, shady nooks near streams from the Atlantic to the Pacific Ocean. The stem is about two feet high, the leaves are twice or thrice-compound with incised and sharply-toothed leaflets, and the flowers are very small, and borne in thick, oblong terminal, feathery clusters. In midsummer, the fruit is a very conspicuous feature of the woods. The flower clusters have given place to a cluster of oval white berries, each with a dark spot on it and each borne on a thick, red stem. The berries are not edible. An earlier species, the Red Baneberry, blossoms a week or two sooner. It produces cherry-red berries borne on slender stems. Curious variations, probably due to intercrossing of the species, are found in the fruits of these plants.

THE WILD COLUMBINE, WHICH LOVES THE ROCKY PLACES

Emerson said:

> "A woodland walk,
> A quest of river grapes, a mocking thrush,
> A wild-rose or rock-loving Columbine,
> Salve my worst wounds."

The Wild Columbine is from one to two feet high, with branching stems bearing many, much-divided leaves with lobed leaflets, and large, nodding, attractive flowers of five brightened, petal-like sepals, and five petals in the form of large hollow spurs which are red without and yellow within.

> "The graceful Columbine, all blushing red,
> Bends to the earth her crown of honey-
> laden bells."

The flowers contain much nectar, which is eagerly sought by bees and humming-birds. The many stamens and the long styles of the five pistils project from the flower as a delicate golden fringe. Many species and varieties of Columbine in different colors, such as blue, purple, and white, are cultivated, and these sometimes escape and grow wild in Eastern Canada.

THE FOAM-FLOWER AND THE BISHOP'S CAP, MITERWORT, TRUE AND FALSE

In rocky woods and on hillsides in early spring, the beautiful clusters of Foam-flower or False Miterwort are found. The stem is five to twelve inches high and usually leafless, with one or two heart-shaped, sharply-lobed leaves growing at the base from the underground stem. The foamy-white flowers, each with a five-parted calyx, five petals on claws, and ten long and slender stamens, are borne in a cluster at the top of a slender stem rising about eight inches above the ground. The seed-pod has the form of a bishop's cap or crown, hence the generic or family name tiarella, meaning turban or crown.

In rich woods, but blossoming later than the Foam-flower, is found the true Miterwort or Bishop's Cap. The raceme is more slender and open, and the few flowers are smaller, more delicate and crystal-like. Both species are common in Eastern Canada. Another species of Miterwort, blooming at the same time, and common in swamps from Atlantic to Pacific, has long, slender runners, from which are produced rounded or kidney-shaped leaves with deep, round teeth, and a clothing of soft hair. The flowers are small, greenish, and arranged in a loose cluster at the top of a slender stem.

A PLANT WHICH HAS NEVER GAINED A COMMON NAME

Clintonia borealis, a beautiful plant without a common name, but usually called Clintonia, shows its three or four dark-green, shining leaves sheathing a stem at its base, at all times in summer. In May or June it sends up a scape four to eight inches high, bearing a cluster of drooping greenish-yellow, bell-shaped flowers. Each flower has a perianth of six colored sepals, six protruding stamens and one pistil—a member of the Lily family. Later in the season, the cluster of flowers gives place to a cluster of blue, oval berries, which are beautiful in contrast with the rich green foliage which carpets the woods.

Toothwort is a pretty spring flower common in rich, moist woods. It has other common names, such as Crinkle-root and Pepper-root, descriptive of the pleasant, pungent flavor of its wrinkled, toothed rootstock or underground stem, which is crisp and edible, and used to flavor many a simple luncheon in the cool shadows of the forest. The stem is leafless below, but bears above two leaves each divided into three toothed leaflets. The flowers are white, in a terminal cluster. Each flower has four sepals which drop off early, four white petals, and six stamens, of which two are shorter than the others. These are characteristics of the Cress family, which belongs to the same order as cabbages, stocks and sweet alyssum.

SOLOMON'S SEAL, AND ITS IMITATION

A story of Canadian spring flowers would not be complete without a reference to Solomon's Seal, the blossoms of which appear in May. The stem is slender, curving, and one to two feet long. The leaves are alternate, oval, and set close to the stem. The yellowish, bell-shaped flowers, singly or in twos, nodding from the axils of the leaves, are fastened to a slender flower-stem so fixed into the axil of the leaf that the flowers each droop beneath in a graceful curve, which is sustained in later summer by the dark blue berries. The rootstocks are marked with large, round scars, somewhat resembling the impression of a seal upon wax, and this suggested the common name.

Wild Spikenard, often called False Solomon's Seal, is a handsome and common plant in some localities. It resembles the true Solomon's Seal only in the leafy stem, which is usually curving and one to three feet long. The flowers are greenish-white, small, and in a terminal raceme, at the end of the leafy stem. The leaves are large, oblong, veiny, and clasp the stem alternately. The fruit is a pale red berry, speckled with purple, and the clusters of ripe berries are found in the late summer months.

Another member of the Lily family, which flowers in May and June in moist woods, is the so-called Canada Mayflower. It has a cluster of small, white flowers rising just above two clasping, broadly-ovate leaves.

TWISTED STALK AND CELANDINE

The Twisted Stalk somewhat resembles Solomon's Seal, with which it is found blossoming in the woods in May and June. The stem is rather stout and zigzag, and bears taper-pointed, slightly-clasping leaves. The whole plant presents a graceful group of forking branches and pointed leaves; and on picking up a branch one finds beneath each of its outspread leaves one or two slender bent stalks, from which hang the dull purplish-pink, bell-like flowers. In autumn it bears round, red berries.

> " There's a flower that shall be mine,
> 'Tis the little Celandine."

Thus wrote Wordsworth of a plant with golden-yellow, clustered flowers, each with two sepals which fall early, four petals and sixteen or more stamens. The stem is brittle and gives a saffron-colored acrid juice when broken. The leaves are much divided, and the seed-pods are long and slender. Celandine is a European plant now common on roadsides in Eastern Canada. In Europe it is called " Swallow-wort," because it is supposed to commence flowering when the swallows come, and cease when they depart.

THE PRETTY, FEATHERY FLOWER OF THE BUCK-BEAN

In May or early June we are tempted deep into the long grass of a swamp by the beautiful, white flowers of Buck-bean. The flowers are clustered along the upper part of a scape about one foot long. Often they are reddish before opening. The calyx is five-parted, the corolla is five-cleft, funnel-form, and fringed on the upper surface with a white beard, which gives the flowers a beautiful, feathery appearance. The leaves are long-stemmed and each is divided into three oblong leaflets. The Wild Bean or Ground-nut, which blossoms in late summer, belongs to another family, and is a true bean. It has a twining stem, which climbs over bushes in thickets. The leaves are divided into three to seven, narrowly-oval leaflets, and the violet-scented, purplish or chocolate-colored flowers, in close clusters, are shaped like a pea blossom. On its underground stems are many edible enlargements shaped like a pear, which suggested the name Ground-nut.

A PLANT THAT EATS INSECTS

One of the most curious of Canadian plants is the Pitcher Plant, common in peat-bogs and swamps from Atlantic to Pacific. The plant bears, close to the ground, a cluster of hollow, cup-like leaves which are reddish without, and pale green streaked with crimson within. The cups are broadly winged at the side and hooded above. These cups not only attract attention by their peculiar pitcher-like shape and rich markings, but they arouse curiosity because of the trap they set for insects. They are partly lined with a sweet juice, below which, for a short space, they are highly polished; while below the slippery surface there are stiff hairs pointing downward. The cups are usually partly filled with water. Insects are thus easily entrapped and drowned in the water. Thoreau wrote: "Though the moss is comparatively dry, I cannot walk without upsetting the numerous pitchers which are now full of water and so wetting my feet." The name Huntsman's Cup is often given to the plant.

THE FLOWER OF THIS CURIOUS PLANT

The flower of the Pitcher Plant appears in early June, and is not less interesting than the leaves. It is red or dull-purple, large and nodding, and suggests by its form the name "Side Saddle" flower. The five sepals are red or purplish, and each has three brackets at the base. The corolla has five fiddle-shaped, red petals which are arched over the greenish-yellow style. There are numerous stamens, and the pistil has a five-celled ovary with a short style expanding at the top into a five-rayed umbrella, under the angles of which the stigmas are placed. It is thought that the plant absorbs the digested bodies of the insects entrapped, and thus supplements the small supply of nitrogen it receives from the poor soil in which it grows. It is, therefore, an example of a "carnivorous" plant.

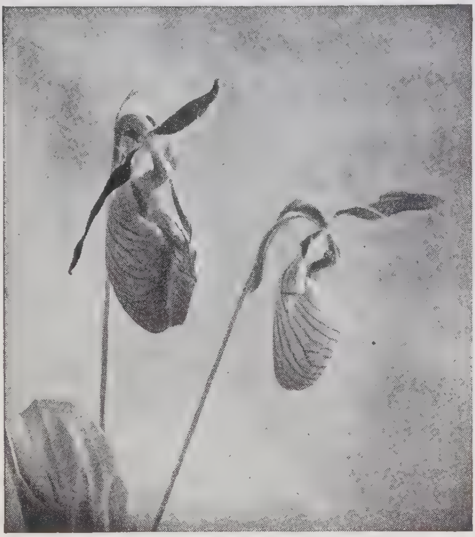
THE FLOWERS OF MYSTERY

The Orchids are among the most mysterious of wild flowers. About sixty species are found in Canada, but many of them are inconspicuous and rare. A certain fascination attends the very name of Orchid, which suggests visions of tropical regions where, most beautiful and sometimes dangerous, they grow to perfection. "Deep hidden in the damp recess of the leafy woods" throughout Eastern Canada the Showy Orchid appears in May. It has a four-angled stem, with leaf-like bracts, rising from fleshy fibrous roots, two oblong shining leaves four to six inches long, and purple-pink flowers in a loose spike terminating a scape. The flower is very irregular in shape, due to the fact that the base of the perianth is closely attracted to the ovary, and only the upper portion is free. The sepals are colored and petal-like.

One of the petals differs much from the others in form and position and is called the "lip." It serves as a sort of platform on which insects alight. In the Showy Orchid it is white in color and wavy in outline. The other petals and the sepals are pinkish-purple, and united to form a hood which over-arches a column composed of a single stamen closely united with a style and stigma. The tip turns down in such a way as to give bees and other insects easy access to a store of nectar at the inner end of the lip near the base of the column. The fine pollen grains are enclosed in a filmy covering, which is ruptured by the head of the bee. The sticky discs of pollen cling to the bee and are carried to the stigma of another flower. The whole structure of the flower seems admirably adapted to bring about cross-fertilization of flowers by means of bees. After pollination, the flowers quickly wither and the ovary grows into a pod filled with many tiny seeds. All Orchids produce thousands of seeds, but notwithstanding the fact that they seem to possess every natural adaptation to bring about perpetuation of the species, Orchids are never very abundant.

Blossoming at about the same time, another member of the Orchid family, Calypso borealis, is found in cool bogs and damp woods, burying its bulbs and coral-like roots in damp moss. "Even when her sanctuary is discovered Calypso does not always reveal herself. The ground and the fallen tree-trunks are thickly padded with moss and embroidered with trailing vines of snowberry and Linnaea; painted trilliums dot with their white stars the shadows lying under the tangled fragrant branches, the silence of the forest, disturbed only by the chirr of a squirrel or the sudden jubilance of the oven-bird, envelopes you and seems the proper accompaniment of such an expedition.

"You follow, perhaps, a winding path made by the wild animals among the underbrush, moving slowly, and you easily overlook the dainty blossom, nestling in some soft, damp nook and poised lightly on its stem as if ready to flutter away between your covetous fingers." The plant consists of a single thin, ovate or slightly heart-shaped leaf from a solid bulb, and a variegated pink and yellow flower with a sac-shaped, inflated lip, two-parted and bearded with yellow and pink. The flower is so exquisite that its discoverer named it after an immortal.



THE PINK LADY'S SLIPPER

THE LADY'S SLIPPERS

The charm of the Lady's Slipper never wanes. There are several species. One of the earliest, the Stemless or Pink Lady's Slipper, is found under hemlocks and pines in early June.

"Graceful and tall the slender, drooping stem,
With two broad leaves below,
Shapely the flower so lightly poised between,
And warm her rosy glow."

There are two large, oval, veiny leaves lying close to the moss and sheathing the base of a scape, eight to twelve inches high, bearing at its top a solitary pink flower with a veiny lip, and inflated pouch. In all species of Cypripedium (Lady's Slipper), the lip is swollen and sac-like, forming a nectary. The column is unlike that of the other Orchids. The single anther, usually present, is sterile, and forms a flap which overhangs the stigma. Two fertile anthers are attached to the under side of the column. The flower is fertilized by the common bumblebee, which forces its way in through the fissure in front. After eating, he takes the easiest way out, towards the base, where he can see two spots of light. As he forces his way out the pollen on his back is rubbed off by the sticky stigma. As he struggles out of the flower an anther, which blocks the passage, clasps its load of pollen on his back, and this is carried to another flower, where the whole process is repeated. Thus cross-pollination of flowers is ensured and self-pollination is rendered impossible. Six other species of Lady's Slippers have been observed in Canada.

The Yellow Lady's Slipper blossoms a few days later than its pink sister. The leaves are alternate, broadly oval, many veined, and plaited. The stem is two feet high, downy, leafy to the top and one to three-flowered. The flower is large, with a pale yellow lip forming an inflated pouch, and two long, narrow, wavy, brownish, lateral petals which give the flower an alert, startled look when surprised in its lonely hiding places. The Showy Lady's Slipper is usually regarded as the most beautiful of all. The flowers are large and white, with the much inflated lip, about two inches long, pink in front. The stem is leafy, one to two feet high, and bears at its summit the solitary blossom. It is found in rich woods during June and July.

Two Yellow Lady's Slippers blossom from May to July. The Small Yellow Lady's Slipper grows in swamps from Ontario to the Rocky Mountains. It bears "golden slippers meet for fairies' feet." The flower is fragrant and graceful, and has a deep-yellow sac and reddish-brown sepals and petals. The Ram's-head Lady's Slipper occurs in cedar and tamarack swamps, but is not common. It bears three or four leaves at the base of a low stem, and a solitary, purplish, drooping flower, with projecting horns and ears, headed by a tuft of wool at the top.

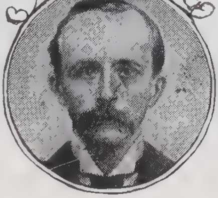
THE NEXT STORY OF CANADA IS ON PAGE 3063.

THE STORY OF PETER PAN

WE all love Peter Pan, the boy who will not grow up. Nobody knows how young he is or how old he is; all that Mr. Barrie, who gave him to the world, knows, is that Peter Pan is ever young, ever happy, ever hopeful. He is the spirit of Youth and Joy, and he was introduced to the world in 1902 by Mr. J. M. Barrie, who found him hiding in the recesses of a marvelous imagination. Mr. Barrie, with his wonderful mind, has given us many books that men and women read with delight, but he will be remembered by children for all time as the man who gave the world Peter Pan. Nearly every year Peter Pan comes to New York, with Wendy and the lost boys, to tell their story in a theatre, and if we want to be very happy we cannot do better than go to this theatre about Christmas-time, when we shall get to love Peter Pan with all our hearts.

HOW PETER FOUND HIS SHADOW

CONTINUED FROM 2759



THERE was once upon a time a little girl named Wendy Moira Angela Darling. She lived in a house with her brothers, John Napoleon Darling and Michael Nicholas Darling. This house was an ordinary house of brick and slates, but one thing about it was quite extraordinary. It contained a Newfoundland dog whose name was Nana, and this dog acted as nurse to the three children.

Nana was so clever that he never allowed the children to put on a flannel nightdress before it was aired at the fire; and he knew how to turn on the hot water when it was bath-time; and however the children might cry that they would *not* be bathed, or that they would *not* go to bed, Nana always insisted that they should.

Now, Mrs. Darling loved Nana, and she had a particular reason for keeping this brave and powerful dog as the children's nurse. One night, on visiting the nursery, she had seen a strange flitting shape moving quickly to and fro in the dim glow of the nightlight. At sight of her this shape rushed to the window. Mrs. Darling darted towards it, and as it sprang into the night she pulled down the window with a bang. The shape escaped; but something fell on the floor at Mrs. Darling's feet. *It was the shadow of this strange, flitting creature.* Mrs. Darling put the shadow in a drawer; but she felt very nervous for the safety of the children. She feared that the shape might come back and do them some dreadful harm. The only comfort she had was the presence of Nana in the nursery. The big dog, she thought, would protect her children from all danger. But one night Mr. Darling was rather cross, and he said it was ridiculous to have a dog for a nurse; and he got so cross at last that he said Nana should sleep in a kennel in the yard. Mrs. Darling pleaded; the children cried; Nana barked. Mr. Darling, however, was extremely cross, and Nana was led away to the yard, moaning and growling.

That night the window was thrust open, and into the room glided and skipped the mysterious shape.

"Where is my shadow?" it cried; while Nana barked furiously outside. "I can't be happy without my shadow. Tinker Bell, Tinker Bell, where is my dear little shadow?"

Instantly a spot of light flicked into the room, and sprang round the walls, and over the ceiling, and down the beds, and across the carpet, making a tinkling sound wherever it flitted and whenever it settled for a moment. This was the fairy Tinker Bell, a little female fairy. She told the Shape where the shadow lay, and soon the drawer was open, the shadow pulled forth, and the Shape skipped round the room with delight, singing, dancing, laughing in its joy, while Tinker Bell flashed round the room like a luminous butterfly. But, alas! when the Shape tried to make the shadow stick on, it refused, and so all the delight went, and the Shape burst into passionate tears.

Just at this moment Wendy awoke. She was not frightened, and asked the little Shape why it was crying. Then she asked it its name, and the Shape told her that it was Peter Pan. Wendy got needle and thread and stitched the shadow on to Peter Pan, and Peter Pan danced with joy, for wherever he went the shadow followed him on the floor.

Then Peter Pan told Wendy his story. He said that he lived in a place called Never-Never-Land, with a lot of little boys who had all been dropped out of their perambulators by careless nurses; and that they lived with fairies and would never grow up, but for always and always would remain happy boys in this enchanting Never-Never-Land.

He told her that when the first baby laughed, the laughter broke into little pieces, and each little piece became a fairy, and went dancing about the world. But whenever a child says that it does not believe in fairies, then one of the fairies dies. Peter Pan said it was dreadful for a child to say it did not believe in fairies. There was only one other thing that made them sad, he said, and this was the want of a mother; all the boys in Never-Never-Land wanted to have a mother very much indeed. Wendy asked if there was not a little girl among them who could pretend to be their mother; but Peter Pan shook his head and answered that *girls* never dropped out of their perambulators, they were far too clever. This pleased Wendy, and she loved Peter Pan.

"Oh, Wendy," cried Peter, "come and live with us and be our mother!"

The two boys woke up, and Peter Pan said he would teach them all to fly if Wendy would only come and be their mother. All this time Tinker Bell was tinkling angrily, and telling Peter Pan to come away at once. Tinker Bell loved Peter Pan, and was jealous of Wendy.

When the children heard that they could learn to fly, they were quite excited, and immediately began to spring in the air. But every time, they fell and sprawled on the ground, or bumped flat on the beds.

"You must think beautiful thoughts," cried Peter Pan; and, so saying, soared up gracefully into the air, and sailed noiselessly round the room.

Soon the children learned, and all began to fly round the room with cries of delight. Then the windows opened wide, and Peter Pan led the way into the night; and while Tinker Bell tinkled loudly and Nana barked warningly, the children soared towards the stars.

THE LOST BOYS IN NEVER-NEVER-LAND

THE boys in Never-Never-Land were growing anxious about Peter Pan, who was their captain. He seemed to be a long time away, and they were afraid of wolves and pirates. While they were wondering what had happened to Peter, they saw what looked to them like a large white bird in the sky.

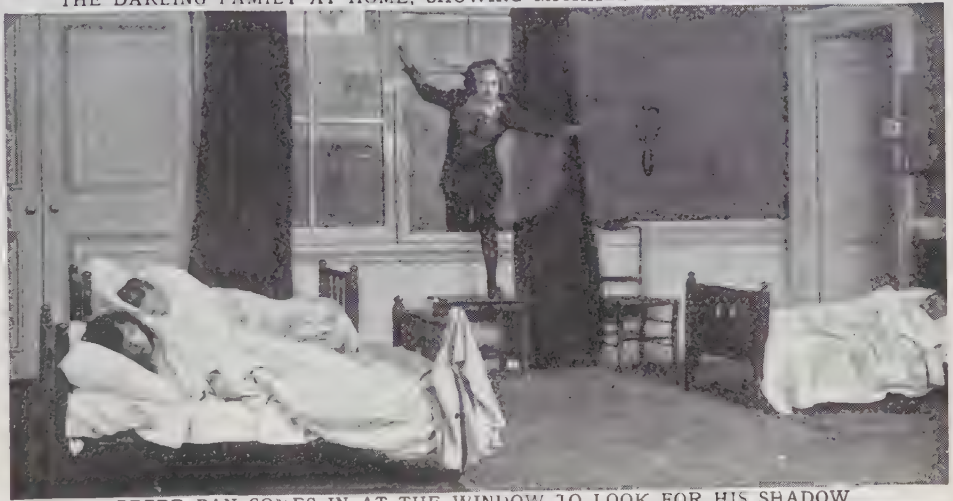
As they gazed at it, Tinker Bell suddenly shone on the trees, and, tinkling very loudly, told them that Peter Pan wanted them to shoot this bird at once. So they ran and got bows and arrows, and shot them into the air. Suddenly down fell—what do you think?—poor Wendy with an arrow in her breast. Jealous little Tinker Bell was responsible for this awful deed.

But she was not killed. Soon she revived, and then with her brothers round her, and Peter Pan holding her hand, she promised all the boys to be their mother. Then they set to, and built Wendy a funny little house, with John Napoleon Darling's silk hat for its chimney-pot; and everybody was wonderfully happy, except Tinker Bell, who was more and more jealous of Wendy.

Now, while they were so happy in their house, through the wood came the terrible pirates. The captain of this frightful gang was named Captain James Hook, and a more horrible villain never froze the blood in a child's veins. All his crew feared him and cowered before him. His long black hair was enough to make you shiver; his yellow skin made you go white; his coal-black eyes struck daggers of fear into your heart; but, far worse than all these, more awful even than his cackling laugh and his way of rolling his "r's" so that they sounded like

THE BOY WHO WOULD NOT GROW UP

THE DARLING FAMILY AT HOME, SHOWING MICHAEL ON HIS FATHER'S BACK



PETER PAN COMES IN AT THE WINDOW TO LOOK FOR HIS SHADOW

THE LITTLE HOUSE THAT THE LOST BOYS BUILT FOR WENDY IN THE WOODS pistols, was his right hand. His right hand wasn't a hand at all, *it was an iron hook.* How he came to have that hook is part of the story.

Peter Pan had tripped the terrible pirate into the sea, and a crocodile, a tremendous *c-r-r-r-r-rocodile,* had snapped off his hand and part of his wrist. Nor was this all. The crocodile enjoyed the captain's hand and wrist so much that it wanted more, and so it haunted the captain wherever he went, longing to eat another bit of him, and dreaming of the happy day when it would gobble him all up. The captain always knew when his ferocious enemy was near, because on one occasion it had swallowed an alarm clock, and the ticking of this clock could plainly be heard through its skin. But the captain feared, because he knew the clock would one day run down, and then the crocodile would be able to steal upon him unawares.

You can imagine how this pirate hated Peter, the cause of all his troubles, and how he longed to slay him.

One day, when some friendly Indians were guarding the boys, up came the pirates and made a great slaughter of the poor redskins. The boys did not hear the battle, for they were much interested in something that Wendy was telling them underground.

Wendy, you must know, had become the mother of these boys, and they all did exactly what she told them, and all adored her, because it was so delightful to have a mother after having lived so long without one. After she had seen mermaids and a bird that gave up its nest for Peter Pan to use as a boat, she settled down to be a real, practical mother, giving the boys their medicine, teaching them how to behave nicely, and tucking them all up nice and comfy in their beds. Considering that she was only nine years of age, Wendy made a splendid mother.

PETER PAN SAVES THE CHILDREN FROM THE PIRATES

Well, on this night, Wendy was telling them a story about her own father and mother—a beautiful story which showed how that mother and father must be weeping for their lost children. As she was finishing, John Napoleon and Michael Nicholas sprang up in their beds, and said:

"Wendy, we must go back!"

"Yes," answered Wendy, "we must go back."

You can imagine how dreadfully sad all the motherless boys were when they heard that Wendy was going home.

They cried so much that at last she told them they might come back with her and her brothers, and live in their house, and have Mr. and Mrs. Darling for their father and mother. All the boys accepted this offer with delight except Peter Pan. Peter Pan said he did not want to grow up. He did not want to live in a real house and go to school every day like other boys. He wanted to live always in Never-Never-Land, with the fairies and birds and mermaids. In his heart he was terribly sad at losing Wendy, for whom his love was very great indeed; but he refused to go away and grow up like an ordinary boy.

So they all said good-bye to Peter Pan, and one by one went up the narrow tunnel which led from their underground home to the forest and the night. Wendy was the last to go, and before she went she poured out some medicine for Peter and made him promise her that he would take it when he woke up in the morning.

THE CROCODILE SURPRISES CAPTAIN HOOK AND SMEE AS THEY DANCE IN THE WOOD

But instead of kind Indians keeping guard, the pirates were there. The boys were seized one by one as they stepped on ground; a rough hand was clasped over their mouths to prevent them from crying out, and they were carried away prisoners to the pirate ship with Wendy.

HOW THE CHILDREN WENT HOME AGAIN

PETER PAN lay asleep in his bed. The rest of the boys were on board the pirate ship. Peter Pan was alone, and asleep.

Captain Hook was creeping to the hole above. Now was his chance to slay his enemy.

Noiselessly the pirate chief crept down the hole. He arrived at the door, and peeped over the top. Peter Pan was fast asleep. He tried to open the door, and failed. Again and again his hook fumbled at the latch, but failed. Peter Pan was safe. But no! The terrible captain espied the glass of medicine left by Wendy on a shelf; he reached towards it, and then, taking a bottle of poison from his pocket, poured the contents into the glass.

Peter Pan woke up. He remembered his promise to Wendy, and went to drink the poison. At that moment Tinker Bill rushed in, crying:

"Don't drink! Don't drink!"

But her warning was useless.

"I have promised Wendy," answered Peter, and walked towards the glass with his hand outstretched.

In vain did Tinker Bell warn him; but, just as Peter was about to drink, the little Shining Light popped into the glass and drained all its deadly contents. Then it flickered and paled and drooped towards its bed, dying.

Peter knew there was only one way in which he could possibly save it.

"Do you believe in fairies? Oh, please say you believe in fairies!" he cried to all the world. And back from the world, which was so sorry for poor little Tinker Bell, came the answer:

"We believe in fairies."

So Tinker Bell revived and was saved, and she told Peter Pan how the pirates had carried off the lost boys, with Wendy and her brothers, to their ship, and of the danger in which they stood.

Peter immediately started out. He arrived at the ship just as the captain was going to flog his prisoners before making them walk the plank. Peter Pan had an alarm clock in his pocket; he took it out, and at the first sound of that *tick-tick* the captain gave a great cry of horror, thinking that the cr-r-r-rocodile was near.

During the panic, Peter stole on board ship and hid himself in the cabin where the cat-o'-nine-tails was hidden.

The clock ran down. The captain grew brave again.

"Go and get the cat-o'-nine-tails!" he ordered.

One of the ruffians went to obey. As he entered the cabin a terrible shriek resounded all over the ship. Another pirate was ordered to go and see what

THE CHILDREN COME HOME, AND FIND THEIR FATHER SLEEPING IN NANA'S KENNEL

The photographs of "Peter Pan" are taken by Messrs. Ellis & Walery.

had happened. He, too, uttered a ghastly shriek, and did not come out.

The rest of the crew were now in a state of panic. They refused to enter the cabin; one threw himself into the sea.

Suddenly Peter Pan rushed out, sword in hand, and a terrible fight followed. Captain Hook was flung overboard, where the crocodile was waiting for him; and all the rest of the wicked pirates were killed.

Then Wendy and all the boys went home, and you can imagine how glad Mrs. Darling and Mr. Darling and Nana were to see their lost children. Mr. Darling, we must tell you, had been so repentant for his crossness that he had made Nana live indoors and dine at the table and occupy his own chair; while he himself slept in a kennel outside, and ate all his meals out of a dog's trough. Mrs. Darling had always kept the window open, hoping that the children would return; and used to play and sing "Home, Sweet Home," thinking that they might hear her and come back.

But Peter Pan, all alone in Never-Never-Land, longed for little Wendy; and Mrs. Darling allowed Wendy to go every now and then to visit Peter, and see that his house was nice and tidy. Peter Pan always refused to grow up, and Wendy never forgot the fairies.

THE FABLES OF ÆSOP THE SLAVE

THE LAWYER AND THE PEARS

A LAWYER was once invited to a wedding feast in a house some distance from his own. As he walked along the road, he came across a small basket of ripe pears lying beside the path. He was hungry enough to have eaten them for his breakfast, but was looking forward to the feast and did not want to spoil his appetite; so he gave the pears a kick and sent them into the muddy ditch.

Some distance farther on he had to cross a small river; but it was so swollen by the recent rains that the little footbridge had been washed away, and there was no boat to be seen.

So at last the lawyer had to give up all hope of crossing the stream, and turned back to go home. He was now so hungry that when he came to the muddy pears lying at the bottom of the ditch he was glad to get them out, wipe them as well as he could, and satisfy his hunger with them.

Waste not, want not.

THE DOG AND THE ASS

A LARGE dog and an ass, loaded with bread, were going on a long journey together. Both at last grew very hungry, and the ass stopped to eat the thistles by the roadside. This made the dog feel more hungry still, and he begged for a piece of bread from the donkey's load.

But the ass answered that, if he was hungry, he must find his own food by the wayside, too, for there was no bread to spare.

Just then a wolf was seen in the distance coming towards them. The ass at once began to tremble, and told the dog that he hoped he would stand by him and protect him if the wolf attacked him.

"No," said the dog. "People who eat alone will have to fight alone."

So he left his fellow-traveler to the mercy of the wolf.

If you want to have friends, you must show yourself friendly.

THE HORSE AND THE ASS

A HORSE and an ass were traveling along a road together, with the man who owned them following behind. The horse had nothing on his back; but the ass was so heavily loaded that he could hardly keep moving. So he begged the horse to help him by carrying part of his burden.

The horse was ill-natured and selfish, and refused to do anything to help, with the result that presently the poor donkey fell exhausted in the road and died there. The owner of the two animals tried to relieve the ass, but it was too late. So he took the whole of the burden and laid it upon the horse's back, together with the skin of the dead donkey; and thus the horse, through his selfishness in refusing to do a small kindness, only brought upon himself a great deal of work and trouble.

We never gain anything by being selfish and unkind.

THE NEXT STORIES BEGIN ON PAGE 2943.

THE FIERCE INVADERS OF AUSTRIA

The Hungarians of to-day are descended from fierce, cruel warriors, who swooped down upon Europe in the ninth century and ruthlessly destroyed everything in their path. After a time these Magyars, as they were called, adopted Christianity, and they are now the most important people in the Austrian Empire

Although Austria joined with Prussia and Russia in 1772 to divide up the kingdom of Poland, it was only ninety years before that Austria was saved from destruction by the Poles The Austrian Empire was overrun by a Turkish army, which was on the point of capturing Vienna, when John Sobieski, the king of Poland, appeared on the scene with an army, relieved the capital, and drove the Turks out of the Austrian dominions. Here we see the Polish troops with their prisoners after they had beaten the Turks.

Rudolph of Hapsburg chosen to head the German states as Holy Roman Emperor in 1273

AUSTRIA-HUNGARY, A DUAL MONARCHY

CONTINUED FROM 2772

WHEN the young Emperor Charles of Austria-Hungary succeeded his great-uncle Francis Joseph on the throne, in the last days of the year 1916, he knew that he had a very difficult task before him. The people who live in the dominions over which he rules are of many different nationalities, and of various races, and have never become united as, for instance, the people of France have done. The people of Bohemia, who are Slavs, are of a different race from the Austrians, who are Germans. The Galicians are principally Poles and Ruthenians, and though the inhabitants of Bosnia and Herzgovina are Slavs, they are quite a different people from the Czechs of Bohemia and the Poles of Galicia. The Magyars, who form the majority of the inhabitants of Hungary, are a different race from the people in Austria and Bohemia, and the Rumanians, many of whom live in Transylvania, the eastern part of Hungary, are not related to any of the other peoples.

The Hungarians have a separate government of their own. Austria-Hungary is often spoken of as the Dual Monarchy, and in Hungary, the Emperor is always spoken of as the King. The Hungarians say that the Austrian government has no rights over their country at all, and that the only point of union between the two countries is the fact that they have the same king. It is true that they have only one army and one navy between them, that their postal service is the same, and there is no duty to be paid on goods sent from one country to the other; and that they have only one Minister for Foreign Affairs, but all this is arranged by treaty as between foreign countries, and the treaty must be renewed every ten years. If we can imagine a state of affairs in which the President of the United States should have the right to be governor of Mexico, without choice by the Mexican people, while at the same time the two nations had separate and distinct governments, that will give us some idea of the union between the empire of Austria and the kingdom of Hungary. It is not a very satisfactory one. The proud Austrians claim the right to be looked upon as the senior partners, while the still prouder Hungarians chafe under the idea that they are held subject to a foreign nation.

When the Emperor Francis Joseph

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died, the new emperor had to go at once to be crowned in Budapest, or as it is sometimes spelled, Buda-Pesth. There, in the Cathedral of St. Mary, he swore to preserve justice and peace throughout the kingdom. With stately ceremony, he was anointed, was invested with St. Stephen's coat, and girded with St. Stephen's iron sword, with which he smote the air, north, south, east and west, in token that he would defend the nation from all its enemies. When he had thus promised to defend the land, he was crowned with St. Stephen's ancient crown, and then and only then did the people of Hungary acclaim him as their king.

Bohemia also was a separate kingdom until it came under the rule of the Hapsburgs when Henry VIII was king in England. The people of Bohemia were, for a time, down-trodden and oppressed, but they still claim that Bohemia is a nation, and that the emperor ought to go to the city of Prague, their ancient capital, to be crowned king.

Ever since men began to travel, and that was very long ago, they have been "going west." Perhaps early man learned the habit by following the sun in its course while daylight lasted, and then resting through the darkness of the night. However that may be, almost all the great peoples of the earth have come out of the east and gone forward toward the setting sun.

THE BEAUTIFUL DANUBE, A GREAT PATHWAY IN EUROPE

Now the great natural pathway, from the east to the west, in Europe, is the River Danube. In our day large steamers carry the commerce of many countries up its broad waters, and railways run along its banks. In times gone by, the Turks found their way along it in their effort to subdue Europe; it was the highway which the Huns followed, when they carried death and destruction into the Roman Empire; the Teuton tribes made their way along its course, and up the hundreds of tributaries that swell the volume of its tide, and, at a still earlier date, it may be that the Celts passed along the same broad road as they pressed forward from Asia to people the rich lands of western Europe. All these people fought to drive back the oncoming hordes. Some were defeated and forced onward, or enslaved; the stronger tribes grew up into nations, some of which were in turn defeated; all of these people intermarried a good deal, and from them are descended the various peoples whom the Austro-Hungarian emperor calls his subjects.

HOW AUSTRIA WAS FOUNDED BY CHARLEMAGNE

When Charlemagne, at the close of the eighth century, was trying to bring under his sway the whole of the western part of the Roman Empire, he saw the danger of leaving unguarded this open road into his dominions, and established a province on the river, near the end of the eastern Alps. This outpost of the empire was called the East Mark, or boundary, and was given to an officer called a margrave to rule with a strong hand. Later it was called the East Reich, or realm, and formed the nucleus of the Austria of our day. After the time of Otto the Great, who drove the Magyars back into Hungary, it became a very important part of the empire. The margraves gradually took for themselves the land to the east, until Upper and Lower Austria reached their present boundaries, and the margraves became strong enough to claim from the emperor the title of duke. The old Roman fortress of Vindobona was made the capital, and grew into the beautiful city of Vienna.

THE COMING OF THE HAPSBURGS TO AUSTRIA

In the thirteenth century, when Rudolph of Hapsburg, a powerful baron of Swiss descent, was chosen emperor by the Germans, Ottokar, king of Bohemia, had succeeded in making himself Duke of Austria, to which Styria and Carniola had already been added. Rudolph, who claimed that these countries were fiefs of the empire, drove Ottokar out and took the Austrian territories for his sons, and from that time on they have been in the possession of his family. Carinthia, Dalmatia, and the beautiful little Alpine country of Tyrol were added to the Hapsburg family possessions. In time they fell by inheritance to the reigning duke, and became provinces of Austria.

Although the Emperor Rudolph was greedy for land and power for his own family, he proved to be a good emperor, for he was strong enough to restore law and order and to keep down the robber barons. He destroyed seventy of their castles in Austria alone, saying that they were not nobles, but "accursed robbers." He was a tall, thin man, nearly seven

AN EMPRESS'S APPEAL TO THE NOBLES

For centuries the sovereigns of Austria looked upon the Hungarians with suspicion, and forbade them to possess arms lest they should rise in insurrection. But when the Empress, Maria Theresa, was attacked by enemies on all sides, and her throne was in danger, she took the bold step of appealing to the Hungarian nobles. Accompanied by her little son, she appeared before them, dressed in mourning and wearing the crown of St. Stephen, the first Christian king of Hungary, and her tears and eloquence moved the nobles to the wildest enthusiasm. Flashing their swords aloft, they declared that they and their sons would die for her.

feet high. He was not a handsome, romantic looking knight, but he had beautiful manners, and so much kindness of heart, that he was loved by every one who came near him, and many stories are told of his bravery. Once, it is said, when he was surrounded in battle and hard-pressed by his opponents, he plunged, full-armored as he was, into a lake and, holding on to the branch of a tree, defended himself until his friends could reach him. Some years after his death, his son Albert became emperor.

After Albert's death there was a gap, during which princes of other states in the empire were chosen as emperors. Then the title went back to the Hapsburgs again, and they were strong enough to keep it, for by marriage and inheritance they gained great possessions.

HOW AN AUSTRIAN DUKE BECAME KING OF BOHEMIA AND HUNGARY

From the very beginning of their history, there was a constant struggle for the mastery between the Austrians on the one hand, and the Bohemians and Hungarians on the other. In the fifteenth century, when King Matthias of Hungary defeated the Emperor Frederick III and took possession of Vienna, it seemed as though Hungary would get the upper hand. But, after the death of Matthias, Frederick's son, Maximilian I, was able to drive the Hungarians out of Austria. He married his grandson, Ferdinand, to Anna, the daughter of the king of Bohemia and Hungary, and when Anna's only brother died at the battle of Mohacs, Ferdinand claimed both these kingdoms as her right. Maximilian was a very learned prince for his time, and encouraged learning in his dominions. He endeavored to rule wisely, and to make better laws, but he was ambitious of gaining more territory, and his wars brought distress on his own subjects and the empire.

Maximilian's grandson, Charles V, who inherited Spain and the Netherlands, was one of the most powerful of the emperors. These countries are so far distant from Austria, and from each other, that some of us have wondered how they came into his possession, but it is really quite easy to understand. One of Charles' grandmothers was the Duchess of Burgundy, to whom the Netherlands belonged; the other was the great Queen Isabella of Spain, who befriended Columbus. Charles inherited the dominions of both his grandmothers, and he inherited Austria also from his grandfather, the Emperor Maximilian. Charles V, of whose reign we have read in the story of Germany, gave his Austrian dominions to his brother Ferdinand, who had already become king of Bohemia and Hungary through his wife, and so, although Spain and the Netherlands passed to Charles' son Philip, the husband of Queen Mary of England, the Austrian Hapsburgs were still the most powerful princes in the empire.

THE COMING OF THE MAGYARS INTO HUNGARY

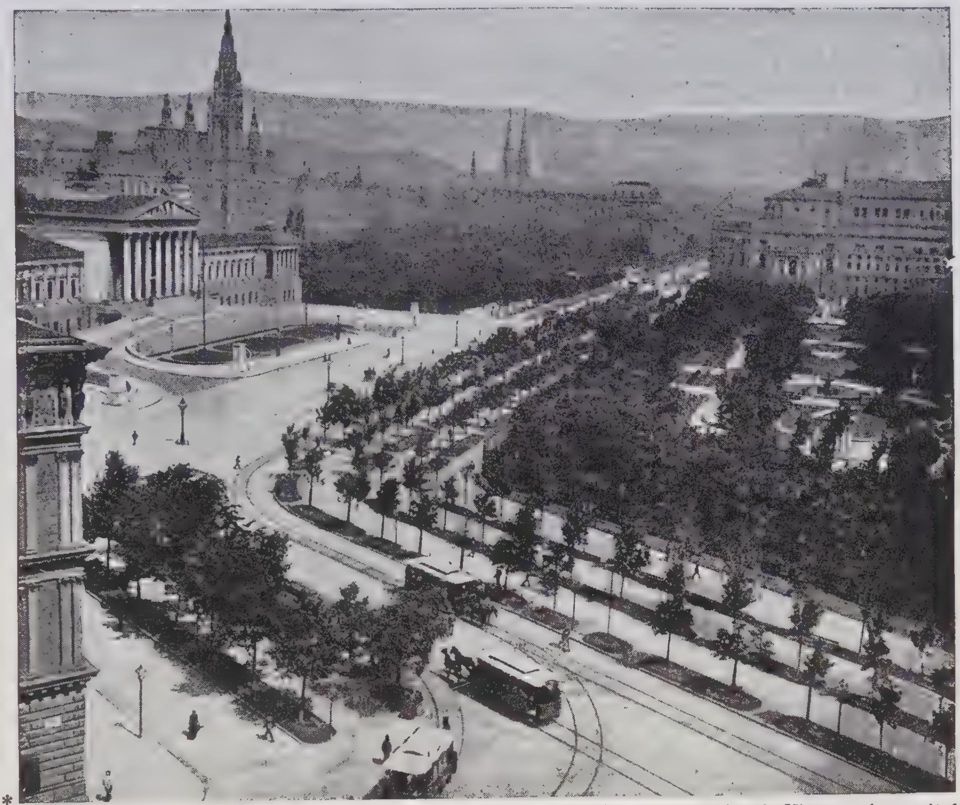
The kingdom of Hungary is composed of the fertile plain which is bounded on the east by the Carpathian mountains, and stretches down, across the Danube to the River Drave. In the time of Charlemagne, the part of the country which lies north of the Danube was called Pannonia and was inhabited by a people called the Avars.

When he dreamed of founding a great empire, Charlemagne marched against these people, overthrew them and ravaged the country. He left it desolate behind him and thus it lay for a hundred years. Meantime, a wild, warlike people named the Magyars, who had made their way westward from Asia across the Volga, were pushed northward by other warring tribes. It is possible that among the Magyars were some of the descendants of Attila's Huns, who had traditions of a beautiful, fertile, mountain-girdled plain which lay beyond the mountains to the west. Fired by these tales, they set out on their hardy little horses, and with their families, their flocks and their herds, they marched to seek the promised land of plenty. Tradition says that the host was composed of seven tribes, ruled by seven dukes, and that these tribes chose Almos, the eldest among them, to be their leader. With Arpad, the son of Almos, at their head, they broke through a pass in the Carpathian mountains, and spread out over the plain below.

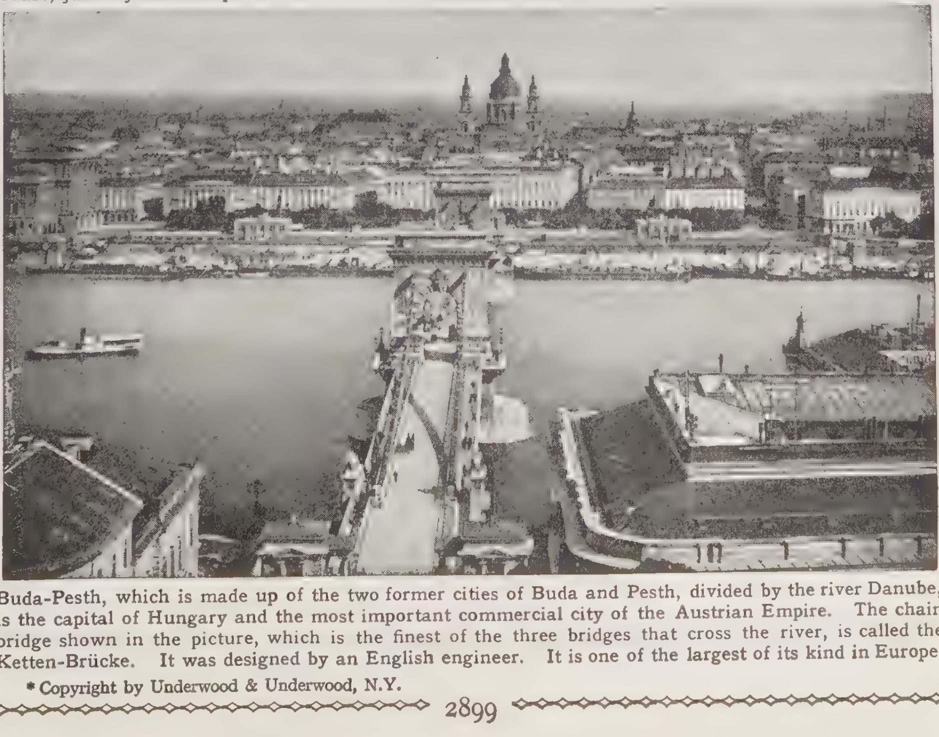
ST. STEPHEN, WHO MADE HUNGARY A CHRISTIAN LAND

In time they began to adopt European ways, and to listen to the teachings of Christianity, but the majority of the people were still pagans when Stephen, the patron saint of Hungary, began to reign. This great monarch established

THE CAPITALS OF THE AUSTRIAN EMPIRE



*Only one other city in Europe can be compared with Paris for beauty, and that is Vienna, the capital of Austria. Its Prater is the finest park in Europe, and the Ringstrasse, a part of which is shown in this picture, is said to be the most magnificent street in the world. On the left can be seen the Parliament House, just beyond the spires of the Votive Kirche, and further to the right is St. Stephen's Cathedral.



Buda-Pesth, which is made up of the two former cities of Buda and Pesth, divided by the river Danube, is the capital of Hungary and the most important commercial city of the Austrian Empire. The chain bridge shown in the picture, which is the finest of the three bridges that cross the river, is called the Ketten-Brücke. It was designed by an English engineer. It is one of the largest of its kind in Europe.

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the Christian religion in the land, built churches and founded monasteries, and under his influence the greater number of the people were converted. He brought order into the country, laid down laws, and established customs, and the Hungarian people like to trace back to Stephen the foundation of their ancient constitution. Because he had done so much for the cause of Christianity, the Pope conferred on him the title of king, sent him a crown, which is treasured by the nation as one of its most sacred possessions, and also forbade the Emperor to claim Hungary as a fief. Stephen lived in great magnificence, and increased the kingly power so that his successors might not be at the mercy of the great nobles, as other feudal monarchs were.

After his death the nation passed through stormy periods. Some of the kings who followed him tried to encroach on the rights of the people, but in 1222 the nobles and gentry, headed by the king's son, compelled Andrew II, who, like King John of England, was a weak and tyrannous king, to give them a charter. Hungarians are very proud of this charter, which is called the "Golden Bull," and speak of it as their *Magna Carta*. It gave no rights, however, to the serfs, and the nobles used it, long afterward, as a means to keep the peasants from obtaining their freedom. Still the charter showed that the Hungarians were a liberty-loving people, and perhaps the feudal system would gradually have been outgrown if it had not been that a new wave of Asiatic invaders swept up the Danube, and almost engulfed the nation.

THE GREAT HERO, JOHN HUNYADI, AND HIS SON, KING MATTHIAS

These were the Turks, who invaded Europe in the fourteenth century, and were kept from destroying European civilization only by the determined resistance of Hungary. In the fourteenth century, in the reign of Sigismund, king of Bohemia and Hungary, and Holy Roman Emperor, John Hunyadi, one of the greatest of the Hungarian heroes, defeated them again and again. If the European monarchs had come to the aid of this great man, the Turks might then have been driven out of Europe, but, though they made many promises, their promises were not fulfilled. For twenty years, the hero carried on the warfare, almost single-handed, and then, worn out by his labors, he died at Belgrade, from which, with a force of 60,000 untrained peasants, he had just driven back 150,000 Turks.

Two years after his death his son, Matthias Hunyadi, a youth of fifteen, was chosen king, and proved to be one of the greatest monarchs that the country ever had. During his reign the fame of Hungary spread through Europe. He raised a great army which kept the Turks in awe; so that the land was free from terror of their attacks. The Emperor invaded the country twice, but each time he was driven back, and the second time Matthias took Vienna, and lived there for the remaining years of his reign. Matthias encouraged art and science, and invited learned scholars to his court, which was said to be the most brilliant in Europe.

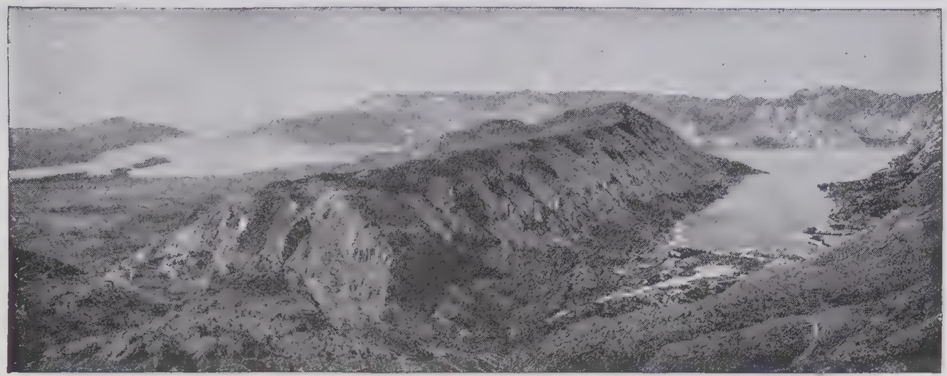
HUNGARY WEAKENED BY STRIFE AND THE KINGDOM LOST

After his strong hand was removed by death, disorder broke out, and in the time of his weak successors, the work that he had done was destroyed. The serfs, whom even Matthias had not thought it necessary to free, rebelled, but the revolt was put down with savage cruelty, and the exactions of the nobles became greater than before. Though they united against the peasants, the nobles fought among themselves. Each sought his own advantage, and while the country was in this state, the Turks again returned to the attack, and Belgrade was taken. Still the nobles would give no aid to the king, who was almost helpless. He had no army, and had no means to pay soldiers even if he had them, for there was no money in the treasury. At last in 1526, when 300,000 Turks swarmed up the Danube, King Louis somehow gathered together a little force of 25,000 men and marched to oppose them. He met them on the field of Mohacs, where his little army was utterly destroyed. He was drowned in a little river as he tried to escape, and his kingdom of Bohemia and part of Hungary passed under the stern rule of the Hapsburg kings.

HOW THE KINGDOM OF BOHEMIA WAS FOUNDED

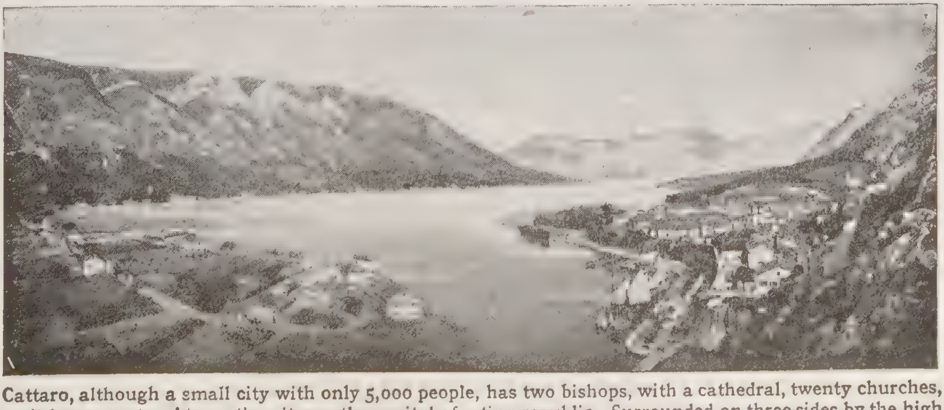
Long before Charlemagne established the East Mark, a tribe of Slavs named the Czechs settled in Bohemia, the country which lies north of Austria, in the basin of the Elbe. It is a beautiful country, well drained and watered by the Elbe and

AUSTRIAN CITIES AMONG THE MOUNTAINS



The Gulf of Cattaro, under the shadow of the Montenegrin mountains, is one of the finest harbors in the Adriatic Sea, although, from this view, one would think it more conspicuous for beauty of scenery than for commercial usefulness. Great rocks divide the entrance into three separate channels, and two of these are so wide and deep that they will allow the passage of very large ships. The harbor is strongly fortified.

Salzburg, which is almost on the borders of Bavaria, is known as the birthplace of Mozart, the great musical composer. The oldest part of the quaint town is the citadel on the Monk's Hill, which was originally built in the time of the Romans. Salzburg Cathedral is a miniature copy of St. Peter's at Rome.



Cattaro, although a small city with only 5,000 people, has two bishops, with a cathedral, twenty churches, and six convents. At one time it was the capital of a tiny republic. Surrounded on three sides by the high mountains of Montenegro, Cattaro loses two hours of light every day, for the sun rises an hour later and sets an hour earlier than at other places in the same latitude. The city has suffered much from earthquakes.

The photographs on these pages are by the Photocrome Co. and Underwood & Underwood, London.

its tributaries, and is guarded and sheltered by the tree-clad mountains by which it is almost surrounded. Men say that it was once an inland sea, which drained away when its waters broke through the "gates" in the "Iron Mountains" through which the Elbe now makes its way northward to the sea. East of Bohemia lies Moravia, which is watered by the Morawa or March, and northeast of Moravia is the little Silesian province which was left to Maria Theresa when Frederick the Great of Prussia snatched the rest of Silesia away. These three little countries together form the kingdom of Bohemia, which has had perhaps the most unhappy history of any nation in Europe. We know little of the early history of the Bohemians and Moravians except that they established a settled form of government at an early date, and that Charlemagne and his successors tried to subdue them, but with small success.

In the ninth century the Moravians were converted to Christianity largely through the work of two Greek monks, Methodius and his brother Cyril. These men may be said to have laid the foundations of Slav literature, for it was Cyril who invented an alphabet for the Slav language, and translated part of the Bible, a prayer book and some other books, for the use of his converts. At this time the duke of Moravia was much stronger than the duke of Bohemia, but the power of Moravia was broken by the Magyars. It became a fief of the Bohemian dukes and kings, and its story cannot be separated from that of Bohemia.

"GOOD KING WENCESLAUS" WAS A REAL KING

The Bohemians were converted to Christianity, partly by Methodius, and partly by missionaries from Moravia. Their first Christian king was Wenzel or Wenceslaus, of whose gentleness and kindness we sing in one of our favorite Christmas carols. But though we call him "Good King Wenceslaus," and he was a very good man, he was not a good king for those troubled times. He was put to death by his brother, Boleslav, who reigned in his stead, and gave battle to the Magyars, whom he defeated so badly that they gave up all attempt to again invade his country.

Then followed four hundred years during which the story of Bohemia is a long tale of quarrels between rival candidates to the throne, of wars with the Poles and Hungarians and wars with the emperors who constantly strove to force themselves upon the Bohemians as their overlords. In time, however, Bohemia was acknowledged as a kingdom, and although the kings were German electors, the country remained almost quite independent.

In the fourteenth century, Silesia was added to Bohemia by King John, who was killed at the battle of Crecy, while fighting with the French against Edward III of England. He was succeeded by his son Charles, who had already been elected emperor, and is known in German history as Charles IV.

THE GREAT EMPEROR CHARLES IV, ALSO KING OF BOHEMIA

Charles, or Karel as the Bohemians call him, was one of the great monarchs of European history. Like Matthias of Hungary, he encouraged art, science and learning. He invited scholars to his court, and established a university, at Prague, which became a centre to which students flocked from all over Europe. He brought order into the kingdom, and encouraged agriculture and commerce; gave the peasants the right to appeal to the king's court—the highest court of justice in the land—and tried to keep down the power of the nobles, which had become very great. The peasants still, however, had some measure of freedom, and it was not until the next century that they were actually brought into a state of serfdom.

Charles' daughter Anna became the wife of Richard II of England, grandson of Edward III, against whom her grandfather, the blind King John, had fought at Crecy. This marriage led to a great upheaval in Bohemia, for some of the men who escorted the princess to her new home brought back to their own country the books that had been written by John Wycliffe. These books fell into the hands of John Huss, a lecturer at the University of Prague, who is paid by Bohemia the same honor that we give to Chaucer who, curiously enough, lived at almost the same time.

JOHN HUSS. AND THE BEGINNING OF THE RELIGIOUS WARS

Now Huss, who was a priest as well as a university lecturer, had already been teaching the need for reformation of life.

He adopted some of Wycliffe's doctrines, and as he was a very popular preacher these doctrines soon spread. Many people, however, thought that the effect of his teaching would destroy the authority of both the State and the Church, and he was summoned to defend himself before the Council of Constance, which had been called to heal the Great Schism in the Church of which we read elsewhere. Sure of his innocence of the charges laid against him, Huss went willingly. But his enemies were too strong for him, and in spite of a safe conduct, or written promise of safety, given him by the Emperor Sigismund, he was condemned and burned, and his ashes cast into the river. His death led to religious wars in which the people fought bravely for liberty of conscience, and for independence and freedom. The forces against them were too strong, however. During the wars the prosperity which Charles had built up was destroyed. The power of the nobles increased, and in the reign of Ladislaus, a Polish prince who had been chosen king of Bohemia, the peasants were reduced to a state of serfdom.

Ladislaus, who had also been made king of Hungary, was succeeded by his only son Louis, the unfortunate king who met his death at the battle of Mohacs. Louis left no children, and Ferdinand of Austria, who was the husband of his only sister Anna, claimed and secured the right to succeed him on the throne.

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The people of the Tyrol are among the most devoted patriots in the world. They have a passionate love for their beautiful country, and have fought bravely to preserve it from the oppressor. They are a simple-minded, devout people, and look very picturesque working in the fields in their quaint national dress.

From this time on the Duke of Austria was also King of Bohemia and Hungary, but although he was entitled King of Hungary, Ferdinand actually ruled over a very small portion of that country. The Turks established themselves in the middle portion; and Hungarian princes succeeded in maintaining Transylvania for a time as an independent principality. Only the northern and western part acknowledged Ferdinand's supremacy, and it was not until after the famous siege of Vienna in 1683 that the Turks were driven out and the country again united.

THE BEGINNING OF HAPSBURG RULE IN BOHEMIA AND HUNGARY

By this time, the great mass of the people in Bohemia, and a large number in Hungary, had adopted the doctrines of the Reformation, to which the emperors were unalterably opposed, not only because they were devout Roman Catholics, but because they were proud and imperious and tolerated no opinions but their own. From the first they began a series of exactions and oppressive measures in both Bohemia and Hungary. They wished to stamp out the Protestant faith, which to their eyes made their subjects not only heretics but traitors, and to destroy the nationality of both countries and make them dependent provinces of Austria. The Hungarians were almost helpless because they had the Turks among them, but the Bohemians determined to throw off the Austrian yoke. They declared that, by their ancient laws, a king could rule in Bohemia only by the will of the nobles, and on the death of Ferdinand's grandson Matthias, they elected Frederick, the elector of the Rhine Palatinate, to succeed him. This, of course, led to war, and unfortunately Frederick could neither rule nor fight. The Bohemians were badly defeated at the White Hill, outside Prague, by the army of the Emperor Ferdinand III, and Frederick ran away. Then the dreadful Thirty Years War began, which devastated all Germany, and Bohemia was hopelessly crushed.

The same system of repression was carried on in Hungary. One by one the ancient privileges in both countries were taken away. The diets were reduced to helplessness, and German was ordered to be used in the courts of justice, and taught in the higher schools, and the constitutions were taken away. The Bohemian crown was taken to Vienna, but though the Hungarian crown was also taken away, the Hungarians were strong enough to compel it to be given back.

THE PRAGMATIC SANCTION AND THE WARS TO WHICH IT LED

For a long time the imperial title remained with the Hapsburgs, and during this time the history of Austria belongs to the empire. By the eighteenth century, however, the Hapsburg family had almost died out and we read elsewhere of the war which troubled Germany when the last of the Hapsburg kings of Spain left no heirs. The emperor who reigned at this time was Charles VI, who had no son. There was no man left in the family to succeed him, and he therefore drew up a document, called a Pragmatic Sanction, which gave his daughter, Maria Theresa, the same rights of succession to the family possessions as if she had been a son.

We read in the story of Frederick the Great how that monarch took away the province of Silesia, and how the king of France helped the elector of Bavaria to try to gain the Austrian duchies for his own. In her distress Maria Theresa called on the Hungarian nobles for help. They rose as a man in response to her stirring appeal, and the Hungarian army was of great assistance in the wars that followed. Bohemia too was loyal, although the country suffered terribly, for armies marched and countermarched through it and great battles were fought in it, and the people were cruelly robbed by the soldiers on both sides.

HOW THE PROVINCE OF GALICIA BECAME AN AUSTRIAN POSSESSION

Maria Theresa succeeded in retaining her throne. Her husband was made emperor and the young Emperor Charles is descended from their son. Maria Theresa did much for Austria, and under her rule it became more prosperous than it had been for a long time. She built hospitals and schools and encouraged learning, and her rule, like her father's, was so kindly that the people of Bohemia and Hungary were almost contented during her reign. In the last years of her life, she was saddened by the partition of Poland, which she could not prevent. Nevertheless, she did not refuse to take her share of the division and join to her dominions the rich province of Galicia, and so added Poles to the various peoples already subject to her rule.

The Poles are a Slav people who pushed forward into the region of the Vistula and the Oder. They settled down at an early date and about the time that Canute was struggling for possession of the British Isles, their king, Boleslav I, also set out on a career of conquest. Before he died he ruled an immense territory stretching from the Baltic to the Carpathians and eastward to the Elbe, but his kingdom did not last. After his death it fell into disorder, the people went back into paganism, and some of his provinces were lost.

Nevertheless, the country won its way back into prosperity; the people became Christians, and they seemed to be on their way to become a strong nation. But after this time, century by century, the strength of the nation waned, because it was always a country at strife within itself. Oftentimes the bravery of the people flashed out, as it did when, under John Sobieski, they saved Vienna from the Turks. But gradually the country went down hill. Many of the nobles became little better than half-savage robbers, while the peasants were miserable serfs. Taking advantage of this wretched state of confusion, Frederick the Great, who wanted West Prussia, suggested, in 1772, that Russia, Austria and Prussia should divide a great part of the country between them. The people were too weak to make much resistance and part of the province of Galicia fell to Austria's share. Two other divisions of Poland were made, in the third of which Austria received the rest of Galicia, and in the nineteenth century she took the ancient city of Cracow.

THE WARS WITH NAPOLEON, WHEN VIENNA WAS TWICE CAPTURED

During the wars of Napoleon, Austria, like the rest of Germany, was invaded, and Vienna was captured twice. At this time the ancient title of Holy Roman Empire was given up, and the emperor took the title of Emperor of Austria instead. We read elsewhere of these wars, however, and of the Congress of Vienna which settled the terms of peace, and shall go on to the events that followed.

During the wars, all the nations were roused, and when they were over, men everywhere looked forward to greater freedom. In Hungary, the great patriot Szechenyi made Hungarian the language of the diet. He helped to found the Hungarian Academy of Science and roused interest in public works, trade and commerce.

THE STRUGGLE FOR FREEDOM IN WHICH BRAVE KOSSUTH FAILED

The Austrian rulers tried to destroy these hopes of freedom, but in vain, and in 1848, the forces in the empire became too strong to be any longer held down. Even in Vienna there was an insurrection. The emperor was compelled to grant constitutions to Hungary and Bohemia and finally had to abdicate in favor of his nephew Francis Joseph. Unfortunately some of the patriots in both countries tried to go too fast. An insurrection took place in Prague, and a rebellion broke out in Hungary, under the brave patriot Kossuth, who tried to establish a republic.

The insurrection in Bohemia was easily quelled, and with the help of an army sent by the Russian emperor, the rebellion in Hungary was put down. Kossuth had to flee into exile and both countries lost everything that they had gained, except that the serfs, who had been liberated, retained their freedom. Kossuth came to the United States for a time, but afterward went to Turin, where he lived for the rest of his life.

Meantime the Italian provinces which had been left to Austria by the Congress of Vienna revolted. They were at first defeated, but most of them finally succeeded in obtaining their freedom, and joined the other Italian states in forming the kingdom of Italy.

THE WAR WITH PRUSSIA AND LOSS OF VENETIA

In 1866 Prussia went to war with Austria over a dispute about Schleswig-Holstein. The Austrian armies were defeated, and in the settlement that followed, Austria was shut out of the German Confederation, which afterward became the German Empire. At the same time, in accordance with an agreement made with Prussia, Italy declared war, for the purpose of taking the Venetian province, which Austria still held. As a result of the war this territory was also lost to the Austrian king.

AFTER THE WAR THE HUNGARIANS GAIN SELF-GOVERNMENT

Then, at last, reforms were made in the government. In 1867 Hungary was given complete self-government, and an arrangement called the "Compromise" was made by which it was agreed that the interests which the two countries have in common should be legislated for by a special assembly. This is composed of an equal number of members from each monarchy and is called the *Delegations*. Austria too was given a constitution which, although it does not give the people anything like the freedom to which we are accustomed, has made life in Austria much more pleasant than it had ever been before.

Bohemia did not fare so well. Little by little the people in that country regained many of their rights. The Bohemian language is taught in all the schools, and in the university. Freedom in religion has been granted to Bohemia, in common with the rest of the empire, and the nation has a form of constitution, and local self-government. They have not, however, been given back the National Assembly. Bohemia is one of the seventeen provinces of Austria, and sends a number of members to the imperial diet at Vienna.

This is Charles I, the young emperor of Austria and king of Hungary, who succeeded to the thrones of these countries in December, 1916.

HOW THE PEOPLE OF AUSTRIA ARE GOVERNED

The Empire of Austria is composed of seventeen provinces, each of which at one time was a separate little country, and the emperor has separate titles for the greater number. For instance he is Duke of Styria, Duke of Carinthia and so on. Moravia and Silesia came into the empire with Bohemia, but each of them is treated as a separate province. Bosnia and Herzgovina were added to the empire in 1908, but the story of how this was done is told elsewhere.

The laws for the empire are made by the imperial parliament, which is called the *Reichsrat* and is composed of a House of Lords and a House of Representatives, elected by the people every six years. Every man over twenty-four years old is entitled to a vote, and in some of the provinces the men are fined if they do not appear to vote.

Bills must be passed by a majority of the members of both Houses, and approved by the emperor, before they can become law, and as the emperor has the right to appoint a large number of the members of the Upper House for life, and every prince of the imperial family has a seat in the House of Lords, the emperor still has a great deal of power. There are eleven members in the Cabinet which is responsible to the *Reichsrat*. Among them however there is no Minister of Foreign Affairs. There is but one Minister of Foreign Affairs for Austria and Hungary and he is responsible to the *Delegations*.

THE PARLIAMENT OF HUNGARY, WHICH MEETS AT BUDAPEST

The Hungarian Parliament, which meets at Budapest, is also composed of two Houses, the House of Lords, called the Table of Magnates, and a Lower House called the Chamber of Deputies, elected by the people, every five years. Suffrage is not universal in Hungary. Only men, over twenty years of age, who pay a small tax, are allowed to vote.

There are ten members in the Cabinet, and the ministry is responsible to the Parliament. Only the province of Croatia-Slavonia has a provincial diet, but the president (called the Ban) has a great deal of power, and is responsible to the Hungarian prime minister.

The last emperor, Francis Joseph, had a long and stormy reign, which began during the rebellions of 1848, and ended in 1916 with the dying year, while the Great War raged around him in Europe. No one else, perhaps, could have held his disunited realms together during these trying times. He gained and held the love of all his people and though Germans and Slavs, Magyars and Rumanians rage at one another, they all loved the kindly old emperor who ruled at Vienna, and looked his troubles bravely and calmly in the face. He outlived his only son by many years, and was succeeded by his great-nephew, who is now the Emperor Charles.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 2981.

WHAT THE WISE MAN TELLS US

THE Wise Man tells us in these pages why it is that children really rule the world, for all people, no matter what their station in life, were once helpless babies. He tells us that "a mother is the holiest thing alive," and why the future welfare of a race or of a nation depends so much upon the proper nourishment and care of their minds and bodies, the most difficult and the most necessary work in the world. He tells us too why the big open green stretches of the country are so much healthier for people than the crowded city streets; and he tells us what it is that makes us grow old and gives us crow's-feet and wrinkles about our eyes and mouths, and how the different kinds of wrinkles either make us cross and disagreeable-looking or pleasant-looking and full of fun. Of these and many other interesting things the Wise Man tells us. Let us read for ourselves and hear what he has to say upon a dozen questions or more that are puzzling our brains. There will be some things which we shall learn, too, about which perhaps we have never thought to wonder, as, for instance, Why is a star star-shaped? or Why can a hammer break a stone when a piece of wood cannot?

WILL THE CHILDREN RULE THE WORLD?

CONTINUED FROM 2804

IT is really true that the children of to-day will rule the world to-morrow. There is nothing we know better than that all men and women, kings and beggars, great and small, began as helpless babies, more helpless than any other kind of living creature, and there is nothing we more constantly forget. All individuals are mortal, and the destiny of the world, the ruling and the being ruled, is all in the hands of the children. Those who rule to-day were the children of yesterday, and will be dust to-morrow. That is the law of human life. It means that "a mother is the holiest thing alive," that history is made in the nursery, that the bringing up of children is the noblest, the purest, and the most necessary work in the world. And it is the most difficult, just because the human being is so wonderful and complicated in the nature of his mind and his body. When at last men come to see that real patriotism, real love of one's country, means, before all things, strengthening and ennobling its human life, and that, since we all must die, this means living to serve children—then not only shall we have the world ruled for children, ruled so that they shall be rightly prized, and nourished, and guided, and loved, and taught; but also these children will, in a few years, grow up, and the world will be ruled by them. The writer has two little daughters. He believes that the highest thing a woman can be is a mother, a maker of the life of mankind. He hopes that they will one day have children; and he lives and works to teach all who will listen, so that the children of to-day, and their children, may live in a better world, where no child starves, or cries, or works, or dies, or is afraid, or cold, or lonely.

WHY CAN'T A BABY TALK WHEN IT IS BORN?

There are many reasons. One is that the baby needs a lot of practice before it can get control over the muscles of its lips and throat and tongue, so as to speak. Even grown-up people, when they learn a foreign language, may fail ever to "get their tongues round" sounds which do not occur in their own language, and every nation accuses every other nation of using "jaw-breaking" words. Another reason why the baby is not able to talk is that the part of the baby's brain by which talking is done is not developed when it is born —neither the part which hears sounds, nor the part which reproduces those sounds.

But the chief reason is that language entirely depends on imitation. We learn to speak by imitating the sounds we hear, and the baby cannot do this until it hears them, and then learns to distinguish them.

The more we study talking, the more wonderful we find it. There is nothing more marvelous in the world, though it is so common, than to watch a baby or a child learning to speak. If a human being, after being looked after for a little while, is entirely left to live by himself, as occasionally has happened, he cannot talk, but can only scream, or grunt, or point to things. It used to be thought that a child left to itself would speak in Hebrew, as that was thought to be the language of the Garden of Eden. As a matter of fact, a child left to itself becomes an idiot, and can hardly be recognized as human. "We are members one of another."

WHY CANNOT WE SEE VERY SMALL THINGS WITH OUR NAKED EYES?

If the retina, or curtain, at the back of the eye were a perfectly smooth, continuous thing like a piece of glass, we should be able to see much smaller things than we do. But it is a living thing made of living cells, and each of these can only see, so to say, one thing at a time. They are a certain size, and take up a certain amount of room, and there is a certain amount of space between them. Thus, the rays of light from a thing must be spread out enough to cover at least two of these cells—perhaps more—before we can expect to see two things separately. Of course, much depends on brightness. If a thing is very bright indeed, it will be seen by one cell of the retina, perhaps. Thus, a star may be seen, though the pencil of light from it is very narrow, while a tiny speck of something under our eyes, which sends a pencil of light just as big, will not be seen until we use a microscope. A large number of the stars we see are really double stars. The telescope shows us this by throwing the light on to more cells than one of the retina of the eye.

WHY IS THE COUNTRY MORE HEALTHFUL THAN THE TOWN?

The country is more healthful than the town only for two reasons, but they are very important. They are that the country gives us purer air to breathe, and more sunshine, as the country air is clearer and does not stop so much of it as town air does. On the other hand, the towns are usually much better off than the country in the matter of sewers and of water. Further, if people are wise and reasonable, it is better for their health of mind to see *not too few* people, and to be not too much forced in upon themselves. In this way the town is better than the country; and it is a fact that there is more insanity in the country than in towns. It is foolish to abuse cities blindly, as many people do. Civilization really means *city-fication.* There never has been a civilization without cities. Athens, and Rome, and Jerusalem, to which we to-day owe almost everything, were cities.

The time will come when people will see this, and will try to make their cities as healthful as the country in air and sunshine. They will not allow each other to make the air impure, and so they will get better air into their lungs and more sunshine; they will build all houses with gardens; they will stop the unnecessary noises of cities; and so will make places where men can meet, and gather, and mix, and make music, and hear each other speak, and discuss things, and do everything which men must do together—while they will keep the advantages of the country.

WHAT IS A GARDEN CITY?

Wise people, instead of trying to abolish cities, are now beginning to build cities of a new kind, which are called Garden Cities. Some day, no doubt, all cities will be of this kind. Every house in a garden city stands free of its neighbors, and has its own garden. The roads are wide and well provided with trees. The rich amount of green leaves helps to purify the air, and the people are not so overcrowded as to make it foul. Smoke is not allowed to come out of chimneys. There are many ways of consuming smoke and making it useful instead of dangerous. No one is allowed to buy a piece of land and cover it with slums. There is a splendid garden city, the first in England, near Letchworth; and certain wise employers have built smaller places of the kind. As we might expect, fewer babies die in one of these garden cities—Bournville, near Birmingham—than in any other place of the size in the whole of England. The next thing that may happen, as people begin to learn good living and good government, is that the land round cities will be bought by the city and used properly, instead of being bought by private people to make money, at the cost of thousands of lives. This is already being done in Germany and Australia.

WHY IS IT THAT SO MUCH OF NATURE IS GREEN?

Wherever life can find a footing in Nature, there we find it. It varies in a thousand ways, but we find it almost everywhere. It is always limited, and decided by the food supply; and thus we find it most abundant where the food supply is most abundant. Thus, the distribution of living things depends on the distribution of the kind of food that they live upon. If that is widely distributed, so are they; if the food is not widely distributed, neither are they. Of all the possible foods for life, by far the most widely distributed is carbon dioxide, as that occurs in the air, and so is to be had wherever the air is. Thus, the most widely distributed kind of life is that which is capable of feeding on carbon dioxide, and the only kind of life which can do this is that which produces the green substance called chlorophyll—one of the most important chemical compounds in the world. That is the reason why so much of Nature is green. And if we know the relation of the green plant's life to our own, we should learn that there *must* be a certain amount of green life in Nature, if we are to live. At present we destroy green fields and cut down green trees without any thought of the results — for our cities, and tables, and other purposes. But much of Nature must always remain green, unless man learns how to use the carbon dioxide of the air as the green plant does; and of that he shows no sign at present.

WHY SHOULD LIGHTNING STRIKE CERTAIN THINGS AND NOT OTHERS?

We know that if lightning can choose between a lightning-rod—that is to say, a rod of iron—and the rest of the roof of a house, it will go down the rod. We know that it will always choose metallic things rather than any others. And it will strike a tree rather than the ground beside the tree. In every case the principle is the same. It is that electricity will always choose the easiest path. The usual way of saying this is that it takes *the path of least resistance*, and the principle is true of many things besides electricity. It is often true of ourselves. Thus, if the electric current can pass to the earth through a tree, it will do so, because the tree helps its passage downwards. That is why we should never stand under a tree during a thunderstorm. But, for choice, it will always pass through anything made of metal, such as iron, for the whole group of metals are good conductors of electricity —the best there are. We do not know *why* they conduct it so well, but we do know that that is the reason why lightning chooses to pass through them. So a lightning-rod will protect a house, provided that it runs right down into the earth. If the lower part of the rod has rusted away before it reaches the earth, as sometimes happens, the electricity will be discharged into the house, and then the rod does more harm than good, for it attracts the lightning to the house, and does not protect it.

WHY DO WE GROW OLD?

This is a most difficult question, which some of the wisest men now alive are trying to answer. The chief reason seems to be that gradually there is heaped up in our bodies a certain amount of the waste products of our lives. We get rid of most of these quite easily, especially the gaseous ones, like carbon dioxide. But there are others which we do not completely get rid of, and at last they poison us, make our limbs and joints stiff, our hair fall out or turn grey, our skin shrivel, and so on. This process takes much longer in some people than in others. It is strictly true to say that some people are older at forty than others are at seventy. This teaches us that it is not the mere passage of time that makes us old, but what is happening during that time in our bodies. People who lead wise lives, especially people who do not eat too much or drink too much, and who get enough sleep, during which the body gets rid of and destroys many of the poisons it produces in the daytime, do not grow old nearly so quickly as other people. Also this is true of people who have quiet minds. Great worry or sorrow "ages" people, as we say; it interferes with the power of the body to recover from exertion and to get rid of its poisons, and so unhappy or fretful people grow old more quickly than those who lead calm and happy lives. The people who take longest to grow old are those who act on two good proverbs: "The best doctors are Dr. Quiet, Dr. Diet, and Dr. Merryman"; and

Joy, and Temperance, and Repose
Slam the door on the doctor's nose.

WHAT IS IT THAT MAKES WRINKLES?

The wrinkles of elderly people are due to a slow process of wasting in the skin. It is a curious thing that we can, by good sense and cheerful minds, control the process of growing old in everything that matters, and especially in our brains, but we cannot in the case of our skin—just where old age shows most, and just where it matters least. The skin becomes shriveled and puckered, and especially do we notice wrinkles in people who are rather thin, for this means that a good deal of fat has disappeared from under the skin, so that it is too loose for the body, and falls into wrinkles. In extremely old people, perhaps ninety years old, the skin grows so thin, and so much of it wastes away, that all the wrinkles disappear, and their faces become quite smooth.

There are different kinds of wrinkles that look very different to our eyes. In people who have often scowled and been angry, and have often felt hate or hardness to other people, the wrinkles which form on the face tell their tale. We say that such a person has a hard face, and children usually run away from such a person; and in other elderly people, who have often smiled and sympathized with others, and have had cheerful lives, and tried to make others cheerful, the wrinkles form round the eyes and mouth in a way that makes them look kind and nice; and children, who are very wise in such things, usually take to these people at once.

WHY DO I JUMP WHEN I GET A SHOCK?

The jump when we get a shock, or the closing of our eyelids when something comes near to them, is called a *reflex action.* Reflex actions are constantly occurring in our bodies, and in those of all living creatures, and we could not live without them. They are called "reflex" because the action follows at once on the thing that excites it, almost as if it were a ball or something reflected from a wall. The mark of a reflex action is that the *will* is not concerned in it; and that is the whole point of this question. We do not want to jump, we do not make up our mind to jump, but we jump first, and then notice that we have jumped. The will does not cause reflex actions, but it can often control them if it has time and warning given to it. That is why we jump at an unexpected sound, as when someone bangs a door; but not at an expected sound, as when we bang the door ourselves.

WHY DO PEOPLE PUT A MARBLE IN THE KETTLE?

The water we boil in a kettle is never pure water, but contains many things. It contains salts, which are apt to be deposited in the kettle as the water boils away. It also contains acids, which are able to act on the iron of the kettle, and turn it into salts of iron, which also fall to the bottom; besides this, they are actually made by the water from the inside of the bottom of the kettle. I suppose, then, that people have noticed that if they put a marble in the kettle, it collects these salts and prevents these things from settling inside it, and keeps the inside of it smooth.

WHY DOES A BICYCLE KEEP UPRIGHT?

In answering this question, we may teach ourselves the way in which we try to solve questions like this. We know that the bicycle does not keep upright when it is still, but it does so when it is in motion. The same is the case with a hoop. The more a bicycle or a hoop moves, the more surely does it tend to keep upright. There must be something, then, in the nature of motion that keeps the bicycle upright; not something in the bicycle itself, or else it would keep upright apart from its motion. When we have gone so far as to realize this, we may hope to find the answer to the question, for we have our attention fixed on the point which contains the answer. Now let us consider what we know about motion, and see whether that will explain this case. Some of us, who have read this book carefully, will now be able to answer the question. Newton's first law of motion must be the answer. This says that a *moving* thing will move at a constant speed *in the same straight line* for ever, unless it is acted upon by some other force. That is what happens to the bicycle or the hoop. It is a *moving* thing, set moving in a certain direction, and, according to the first law of motion, it *must* go on moving in that same line until something interferes with it, and so it keeps upright.

WHAT IS INERTIA?

We probably know what we mean when we say that anyone is *inert*. It means that he does nothing "of himself," but has to be made to do anything he does, and that he is even then only *passive*—acted upon, not *active*. *Inertia* is thus the name given to the property of matter by which, in the question of motion, it is inert. If at rest, it remains at rest until something acts upon it. If moving, it goes on moving, changing neither its direction nor its speed, until something acts upon it. In other words, the first law of motion, which explains why a bicycle keeps upright, is the law of inertia. It says that, so far as motion is concerned, matter is passive, resting unless something moves it, and moving unless something brings it to rest. This inertia, or passiveness, or tendency to go on doing what is being done, is also, I think, the first law of mental motion. Our minds do not move unless and until something moves them; and when we have got "into a groove," as we say, we are likely to stay there until something jogs us out of it. We ought also specially to remember what people usually forget—that inertia, whether of matter or of mind, is shown as much in the going on until something interferes, as it is shown in resting until something interferes.

WHY HAVE THE STARS JAGGED EDGES, NOT ROUND, LIKE THE MOON?

This is one of those many cases where what we seem to see is not at all in what is outside us, but is in ourselves. If we look at the stars through a telescope, or if we have perfectly shaped eyes ourselves, or use spectacles very accurately made to suit our eyes, the stars do not always seem to have jagged edges, but may be seen as sharp points of light. So part of the answer to the question is that the eyes of most of us are not quite perfect in the way they throw the light on the retina, and that this defect causes a blur, and is revealed especially when the thing we are looking at is very small; or, rather, seems very small, as the light from it only strikes upon a very tiny portion of the retina. It may be, also, that this appearance of the stars is partly accounted for by a special fact about the eye which is called *irradiation*. This means that the image of any bright thing is apt to spread itself out, or *irradiate*, in the eye, so that it seems to excite parts of the retina on which the light is not really falling at all. The excitement spreads a little, somewhat as a dot of ink, made on some kinds of paper, spreads a little round it—and so the thing we look at seems bigger than it really is, and often a little irregular in shape.

WHY IS A STAR STAR-SHAPED?

When I had answered the last question about the stars, said the Wise Man, I thought I had better go out and see the stars, as it was a clear night, and the first I saw was Capella, one of the finest in all the sky. It lies below and to the left of the L of Perseus, as everyone should know. And though I was wearing accurate spectacles, Capella was most perfectly star-shaped, with four beautiful points at equal distances from each other all round its edge. This perfectly regular figure, which has been noticed in all ages, and from which the starfish gets its name, is undoubtedly due to the structure of the eye, and it seems to depend partly on the state of the eye at the time, as we do not always notice it. It is never seen in the photograph of a star. When we study the arrangement of the sensitive points in the curtain of the eye, it seems that the sharp, bright image of the star falls upon one of them only, and then, by a sort of sympathy, affects equally those that are packed closely all around it, and we may perhaps find that the arrangement of these *cones*, which is the name we give to the sensitive spots in the centre of the retina, is just such as would account for the appearance of a star. It is probable that no other thing but a star produces a pencil of light so fine as just to strike directly one cone of the retina, and only one.

WHY IS FIRE COOLER THROUGH GLASS, IF GLASS MAKES THE SUN'S RAYS HOTTER?

This would, indeed, be a puzzle if it were true. It would mean that the radiant heat from a fire is somehow different from the radiant heat from the sun. It is true that glass cuts off the heat of a fire, as everyone knows who has used a glass screen in front of the fire. But it is not at all true that the sun's rays are hotter through glass than in the open. The glass of a greenhouse cuts off a good deal of the sun's heat, just as it would cut off the heat of a fire. But the air is kept in the greenhouse, and so gets hotter and hotter. It gets the heat and keeps it to itself, so that it does not get out again. So a greenhouse, though it keeps out some heat, grows hot because it is *a trap for heat*, and keeps what heat it does get. Of course, the sun does not always shine, and so we must have hot-water pipes in a greenhouse to make the air hot when the sun does not. A tent acts in the same way; and everyone knows how hot the inside of a tent becomes. It cuts off a lot of heat, but it lets some through and then traps it by making it heat the air which it confines within itself.

HOW DOES THE SUN MAKE A MAGNIFYING GLASS BURN A PIECE OF PAPER?

This question would be better put the other way round—how does a magnifying glass make the sun burn a piece of paper? Just in the same way we say that the sun makes the green stuff of the leaf decompose the carbon dioxide of the air, but we should say that the sun does it by means of the leaf. Always the sun is the real cause. In this case it is the concentrating power of the lens that helps the sun. We know that when light passes through a convex lens it is bent towards the thickest part of the lens—which is the centre—and that the rays are all brought to a point, which is called the *focus*. We see this when we make the experiment of burning paper. We see the light brought to a focus, but it is not the light that burns the paper. If, instead of the glass, we had a hollow globe filled with cold water, kept changed, the light would be thrown on the paper just the same, but it would never burn. It is the heat-rays of the sun that burn the paper, and the interesting thing, which we must be careful to remember, is that heat-rays are bent by lenses exactly as light-rays. The two kinds of rays obey exactly the same laws, which is natural enough, since they are varieties of the same thing, though we happen to feel the one and to *see* the other. Of course, no heat is made out of nothing in this case, or in any other case. The paper round the bright centre loses the heat which the centre gains.

HOW WILL A HAMMER BREAK A STONE, BUT A PIECE OF WOOD WILL NOT?

A stone is held together by a special kind of force in the molecules that make it up. This force is called *cohesion*, or sticking together. When the stone is broken this force is overcome, so that the molecules are forced apart. Now, if a force is to be overcome it must be by a stronger force. It must be, then, that there is more force in the blow of a hammer than there is in the blow of a piece of wood, and that is exactly the case. The reason why the hammer-stroke is more forcible depends upon the heaviness, or mass, of the hammer. Let us suppose that the wood is moved at the same rate as the hammer. Then the hammer is more forcible in proportion to its greater mass. If the hammer were moved slowly, and the wood at a very great speed, the stone would break if the wood did not. The force of a moving body depends on two things—its mass, and the speed at which it moves.

CAN A FISH SEE AND HEAR US?

If we go to an aquarium, or to the fish-houses at some Zoological Gardens, we shall soon see for ourselves that fishes can see us, and see very well and quickly, too. Every fisherman knows this. He knows, too, that fish are very particular about color, and that they catch things by sight as well as by smell; for a fisherman's flies are not scented, but colored, and the fish come to them very readily if they are of the right kind. Then we all know that fishes have eyes, for we have all seen them, and they are quite highly developed eyes, not so very much inferior to our own, and made on much the same pattern. On the other hand, fishes are decidedly inferior to us in hearing; though they are by no means deaf, they do not respond to music as they seem to respond to color.

THE NEXT QUESTIONS ARE ON PAGE 3043.

A quarry, showing how the earth's crust is made of layers of rock like limestone and sandstone

THE EARTH'S CRUMBLING CRUST

CONTINUED FROM 2847

As we have learned, astronomers are trying to understand a little of the history of some of the heavenly bodies. We know a very little of the history of the stars, and this is helping us to learn something about the history of the sun. As regards the history of the moon, we might expect to be able to learn a great deal, but this offers many difficulties, and, indeed, there are many careful astronomers to-day who declare that even what we call the volcanoes and craters of the moon are not really volcanoes, but are the marks of scars left upon the moon after its surface, unprotected by any atmosphere, has been struck by huge meteors. The lesson we have to learn is that explanation, or interpretation, as it is called, is very difficult, and must only be made after description.

If now we turn to our own earth, we shall expect here, at any rate, to be able to read a definite history. Not only have we the moon, as it now is, and the differing states of the various planets such as Mars and Jupiter to guide us, but the earth's crust is under our very feet ; we can dig mines in it ; we can make still deeper borings in it ; we can study the sides of its great gorges ; we can climb its mountains, and so we should be able to read its history. It has been necessary, not once, but often, in in what we have already learned, to refer to this study, which is called Geology. We have learned a little, for instance, of the part that water plays in the history of the earth ; we have heard about the element radium, which helps to keep the earth's crust warm ; we know that there are rocks which were formed by water, and rocks which were formed under the influence of heat. We shall now make a survey of the main facts and ideas of geology, enough for us to be prepared to follow what the geologists shall teach us in the future, for our best knowledge of geology is no doubt yet to come, and will be coming very soon.

We all know that not many years ago there occurred in the south of Europe the greatest earthquake recorded in human history. Now, it is earthquakes, and the eruptions of volcanoes, and the other violent things which occasionally happen that tempt us all into an utterly wrong idea of the earth's history—an idea which, though wrong, was generally believed in by geologists less than a hundred years ago. We sometimes think that it is the violent, exceptional things that have made the history of the earth, earthquakes, hurricanes, tidal waves, and so on. We notice nothing else happening, or if we do notice such a thing as that the bed of a river is becoming wider or deeper, we cannot imagine that such little and slow things can count for much. We look at the history of the earth just as historians once looked upon the history of mankind. One of the greatest authors of modern times has written words which are for ever a lesson to historians of mankind and to students of the earth's crust. In his book on the French Revolution, Carlyle tells us how the oak grows for a thousand years in the forest, little by little, and no one takes any notice; then perhaps it happens that the lightning destroys it, and everyone records the fact.

THE HISTORY OF THE WORLD IS BEING MADE IN EVERY NURSERY ON EARTH

The truth is that the history of men is being made at this moment in every nursery on the face of the earth; and the history of the earth's crust, like the history of man, is really made, from moment to moment, by little things which do very little in a moment, but do a great deal in a million years. We need not here trouble about the long words which describe the two opposing schools of geology. It is enough for us to know that victory all along the line lies with the newer school, who believe in the slow, continuous making and changing of the earth's crust, as against those who believed that the earth's history has been alternately periods in which nothing happened, and times of destruction in which all life was killed, and then a fresh start made.

The newer and truer view not only helps us to understand the past, but it transforms the study of geology for us to-day, because we to-day, as we cross a stream, or see the rain fall on a rock, or play with the sand on the seashore, can see and watch for ourselves the slow happenings which have made, are making, and will make the history of that narrow belt between earth and sky which gives birth to all living things.

PERHAPS ANOTHER SHAKESPEARE OR ANOTHER NEWTON WAS BORN TO-DAY

This is a great idea, and it applies equally to human history. We find that there is no news in the papers, and we think that nothing is happening. We are very wrong. Perhaps another Newton or another Shakespeare was born to-day, or a baby who will become a statesman and save or destroy his country. Human history is always being made. This book is making it; we are making it, as we are writing or reading these pages; and the rain at this moment outside is making the history of the earth's crust. But it is one of the laws of our minds that we do not notice what we are accustomed to see. What really catches our attention is something that is new, or big, or quick. As long as the ball of paper is still, the cat will not move; we twitch it and the cat sees. We also see when things are twitched. We put our history, or the earth's history, down to battles and earthquakes, not to the quiet mothers whose names are unknown, nor to the rain and the dew falling where no one sees them. The greatest thing that science has to teach us is that history is always being made everywhere, and that only what might be called the bubbles, and froth, and splashings of it—that are called earthquakes, and battles, and so on—get into the newspapers.

HOW GEOLOGY TELLS US THE STORY OF THE EARTH

So now, having already learned what is by far the greatest lesson that geology has to teach us, we may go on to look at the main facts of the earth's crumbling crust. We must borrow help from almost all the sciences; we must know everything that geography can teach us, for the geography that deals not with cities, but with mountains and rivers and so forth, is simply the latest chapter, but not the last, of geology.

We must learn everything that the chemists can teach us about the atmosphere and the weather. If the chemist finds carbon dioxide in rain, and can prove that that carbon dioxide helps to melt the rocks, that is part of geology. If students of the wind observe how it alters the surface of things, that is part of geology. We must study, where we can, the results of frost and rain, waves and tides, rivers on the surface or under the surface, glaciers or ice rivers. These are the tools of earth sculpture. If we watch them at this moment, we can see them carving, molding, biting, smoothing, wherever there is dry land, and so we can learn to read the history of the earth. Geology also borrows from the students of earthquakes and of volcanoes. The greatest results of earth sculpture, we know, are the mountains. Is it earthquakes and volcanoes that have built the mountains? Up to the present this has been generally believed. But geology, which is the borrowing science, borrows also from chemistry, and in the twentieth century chemistry is beginning to teach that there are elements of which radium is the type, our study of which will utterly change our ideas of mountain building.

HISTORY & POWER ARE NOT IN VIOLENCE, BUT IN THE STILL SMALL CAUSE

As in every case before, this new change, which is only just beginning to take place, is in the direction of teaching us that the sudden, big, disastrous, sensational things, like earthquakes, are not the most powerful forces at work; or if they are the most powerful, they are not the most effective. Earthquakes have had something to do, no doubt, with mountain building; yet it is more likely that at least one great agent of mountain building has been the slow but steady change in the earth's crust produced by the presence of radium, which is a ceaseless maker of heat with all its consequences.

But the borrowings of geology are not yet ended. It learns a great deal from that department of chemistry which is called mineralogy, or the study of minerals. Everything mineralogy has to teach about crystals, how they are made and how they break, how they are melted, what they weigh, how hard they are, and so on; and not only these things, but also the places where minerals are found in the earth, how they lie in veins, as they are called—all these things come to form part of geology. Nor has this exhausted our sources of knowledge. Everything we know about life contributes to geology. The rocks have records of many forms of life, some of which are utterly different from any now existing, while others cannot be distinguished from living forms.

THE WONDERFUL WAY IN WHICH WE LEARN FROM BURIED ANIMALS

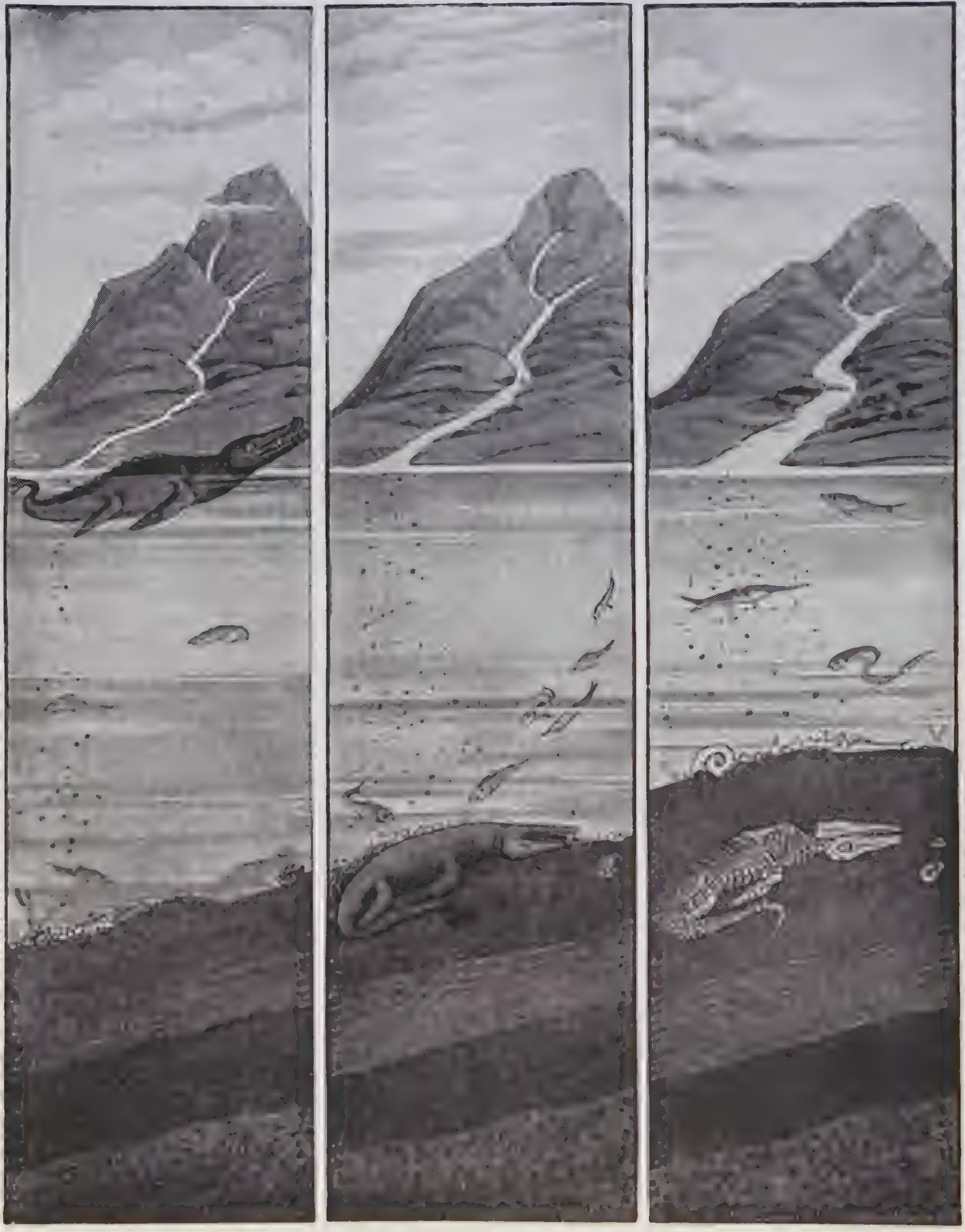
Geology gains enormously from the study of these remains, and it is no less true that the study of life gains greatly from geology. Indeed, the record of the rocks and the record of life are largely one. Unfortunately, the rocks have not yet taught us all we might hope to learn regarding the history of life. It is now many years since the publication of that great book "The Origin of Species," in which Charles Darwin discusses what he called the imperfection of the geological record, and that record is still imperfect. But if we come to think of it, there is something wonderful in the fact that fossils are preserved at all. We need not wonder that they are so few. If we consider how many conditions are necessary for a fossil to be made and preserved, we shall wonder that they exist at all. Frost and rain and the sea, dripping water, pressure, heat produced by lava, and so on, must have destroyed countless millions of fossils; nor is the body of every kind of living creature fitted to produce a fossil at all.

But the people who complain that the rocks do not teach us what we should expect about the history of life forget how very little of the rocks we have yet studied. To begin with, only two-sevenths of the earth is at present above water. Every portion of that has no doubt been below the water, and the present ocean-beds have at one time been dry land covered with life.

THE KNOWLEDGE THAT HAS GROWN FROM THE STUDY OF A BIT OF THE EARTH

All we have access to is what is found on these two-sevenths, which is by no means necessarily the most important part of the globe so far as the history of life is concerned. But even of this portion only tiny points have been studied, especially a good deal of Western Europe, with bits here and there elsewhere. We have not begun to examine properly anything like one-thousandth part of so much of the earth as we can examine at all. The really marvelous thing is that so little inquiry has produced so much result. We should know that latterly these results have dealt not only with the past history of animal life, but with the past history of vegetable life. During the last century we have actually discovered scores of thousands of different species of fossils, and, as Professor Huxley said, "we have no more ground for doubting that these creatures really lived and died at, or near, the places in which we find them, than we have for doubt about a shell on the seashore. The evidence is as good in one case as in the other."

THE CHANGING EARTH FROM AGE TO AGE

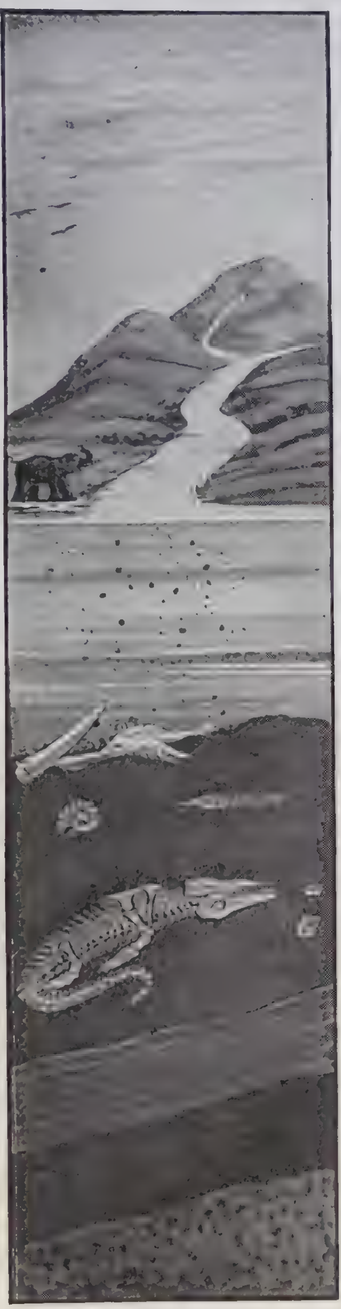


The history of the earth for millions of years is written in its rocks, and men are able to read what took place, and to give us, in pictures like these, a vivid panorama of the earth's long story. We can see also how that story came to be written in the rocks. A million years ago, a little stream trickled down a mountain, carrying with it sand and stones, which fell to the bottom of the sea. In the sea swam a wonderful creature called an ichthyosaurus.

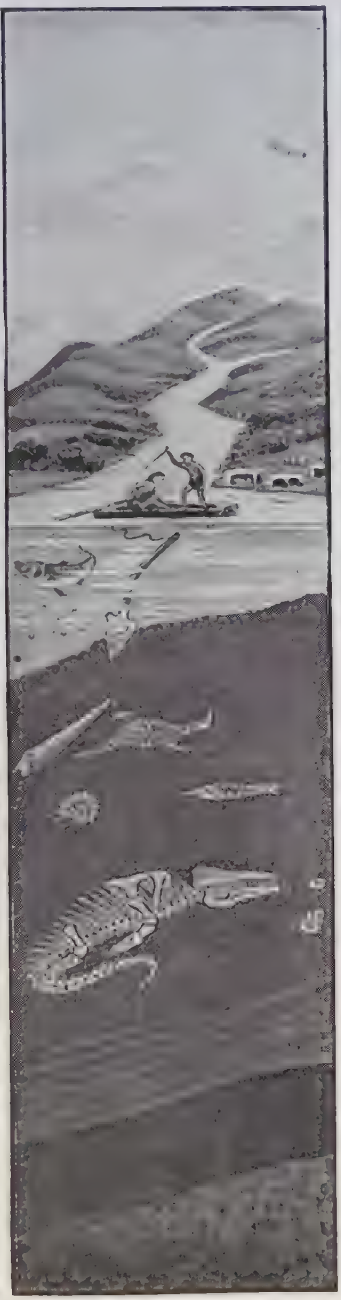
The ichthyosaurus was a reptile that lived in the sea, and its name means "fish-lizard." It had a great head with powerful jaws and teeth, and its body had four limbs like paddles which enabled it to swim. One day the great creature died, or was killed in battle with another strange monster, and its body fell to the bottom of the sea. Meanwhile, the stones and sand brought down by the stream continued to fall upon the bed of the sea.

As the ages passed, the stream gradually wore away a wider and deeper bed, and became a big river; and the rains falling upon the mountain loosened the soil and formed hundreds of streamlets. These ran into the main stream, and each did its part in wearing away the mountain. As the river became wider, it brought down more and more earth and stones, which fell in a never-ceasing shower upon the bed of the sea, until the great reptile's body was buried.

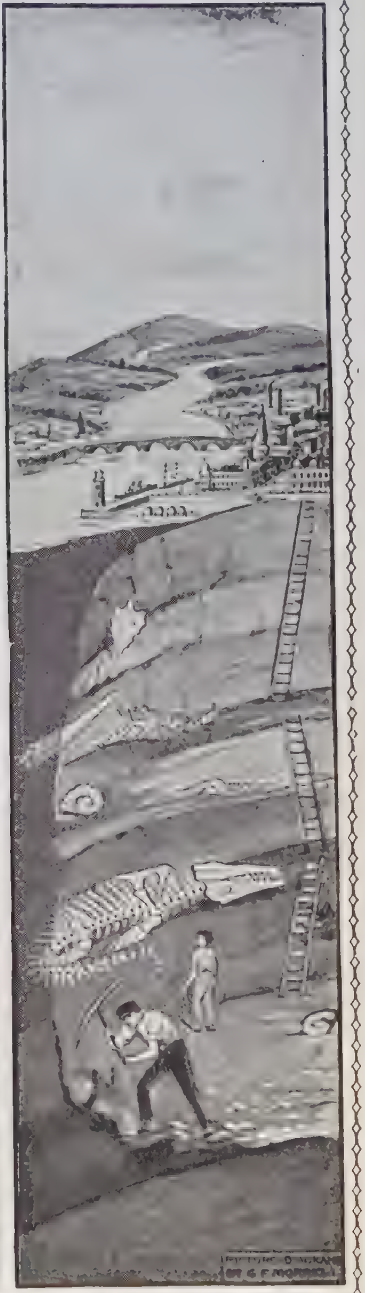
THE WONDER-STORY TOLD IN THE ROCKS



Higher and higher rose the ocean-bed as the mud from the mountain continued to fall, and the lower layers became pressed into hard rock. One day an elephant broke off his tusk, which fell into the river, was carried down and sank in the sea. Another day a bird was drowned, and it fell on the ocean-bed. Dead fishes and shells also sank, and all were buried by the never-ceasing shower of mud, earth, sand and stones.



All through these ages the rain and river were wearing the mountain away. Hundreds of thousands of years after the ichthyosaurus died, men began to live on the earth, and one day a man who had made a boat out of a hollow tree-trunk went out to fish. Trying to spear a big fish, the head of his harpoon broke off and fell. It was too far down for the man to recover it, and this also was buried in the mud.



The bottom of the sea crept higher, till at last it became dry land. Then men began to dig, and the world's wonderful story was revealed. First the spear-head was found, then the tusk, the bird's skeleton, the shells, the fish, and at last the skeleton of the great reptile, all turned to stone and become fossils, a word meaning something dug up. Only a few years ago, a great fossil skull was dug up in Fleet Street, London.

What we learn in this way is really a record composed of mud, and though we might suppose that it is not worth anyone's while to ask how mud is formed, yet the answer to this question is a key to a great deal of geology. Mud is formed by the action of water, wearing down the surface of the earth and rocks with which it comes in contact, pounding and grinding them down, and carrying the pieces where they can rest together.

ROCKS THAT ARE NOW BEING MADE AT THE BOTTOM OF THE SEA

Every wave of the sea as it breaks on the shore does this; and thus, to quote the words of a great authority, "slowly but surely the hardest rocks are gradually ground down to a powdery substance; and the mud thus formed, coarser or finer, as the case may be, is carried by the rush of the tides or currents, till it reaches the comparatively deeper parts of the ocean, where the water is so calm that the finest particles can sink to the bottom."

In a similar way the river carries part of the land into the sea, and so layers of mud are formed at the bottom of the sea. These gradually harden, and make a record of time. When they are hard, we call them sandstone or limestone, or whatever the rock may be. The surface of the earth is made up of these rocks, of which we know a thickness of not less than 70,000 feet. They are being made now. Such chalky rocks as we know are found at Dover, for instance, are actually being made at this moment at the bottom of the Atlantic.

A tremendous story is written in these rocks. We know, for instance, what myriads of creatures are living in the sea, and when they die, their shells and hard parts, lying at the bottom, may be covered by the fine mud which is brought down by the wear and tear of the sea and the rivers.

THE STORY OF THE STRANGE THINGS THAT WE SEE IN THE MUSEUMS

This mud becomes hardened, and ages afterwards people may walk into a museum and see the piece of sandstone or limestone in which these remains are embedded. This process applies as well to many land creatures. It applies to such cases as where turtles' eggs were laid upon the sand, but before the sun had time to hatch them, were covered over with chalky mud. All this occurred unthinkable ages before mankind existed, and the results are now to be seen by us. Or the bodies of creatures may drift to sea, or get buried in bogs, or be crushed into the mud at a river's bank.

It is, however, very rare to find the remains of a wild animal in fossil form. Either they die where their bodies are not protected by mud, or the bodies are eaten. Not only so, but when the bones of an animal have been safely embedded in mud, they may yet be dissolved completely away by water containing carbon dioxide. Huxley had some pieces of rock sent to him from Scotland which contained no fossils or bones, but holes only. When those cavities were filled with something, so that a cast was made of their shape, it was found that they corresponded to the vertebræ and part of the armor of some great reptile more than twelve feet long. As Huxley says: "This great beast had died and got buried in the sand; the sand had gradually hardened over the bones, but remained porous. Water had trickled through it, and that water, being probably charged with a quantity of carbon dioxide, had dissolved all the calcium phosphate and carbonate, and the bones themselves had thus decayed and entirely disappeared."

THE GIGANTIC CREATURES OF THE PAST THAT LIE HIDDEN IN THE ROCKS

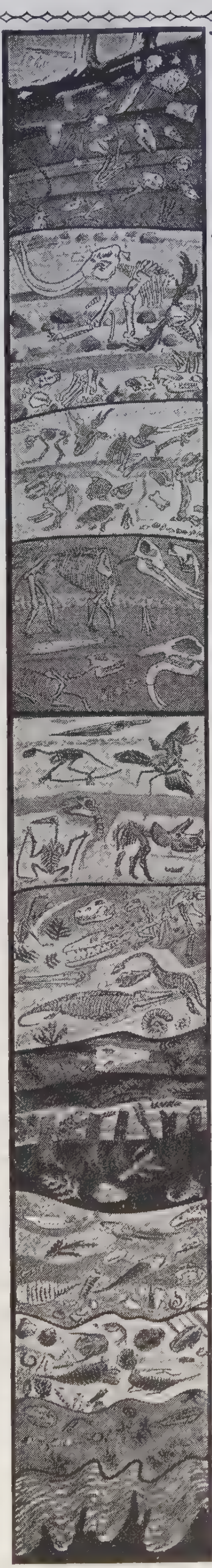
Now that we understand what fossils are, and how they are formed, we must learn what they teach us. This part of science has a special, long name of its own, and men may devote their whole lives to small parts of it. Here, of course, we want to know the great result of all this study, if there is such a result. We find, then, that these fossil remains, both animal and vegetable, correspond very largely with the living forms of to-day, and yet differ from them. If we were to walk through a museum containing fossil remains mixed up with those of creatures now living, it would only be when we looked closely that we should notice differences. One very notable exception there is to this, and that is the case of certain very large reptiles, very fierce looking and alarming, which no longer exist. Only lately have we learned the astonishing size that these creatures attained, and no one should live in, or visit, New York without going to the Natural History Museum on

Central Park, to see the amazing skeletons of these extinct beasts that have been mounted there. Our study of the rocks thus teaches us something about life which we must notice here. It is that at one time Life tried the method of sheer bigness; tried it persistently and tried it thoroughly, and it failed. These creatures grew to be as big as houses, but their brains were tiny, and the law of the world of life is that mind is the master of matter. Their size did not save them from the results of their stupidity. People who now devote their lives to the culture of their muscles, and forget the culture of their minds, may learn something from these monstrous reptiles of the chalk deposits.

A very vivid way of getting an idea of the rocks and their contents is to put down in order what we should come across if we began to dig, say, in Trafalgar Square, London. First, we should come upon beds of gravel or drift, containing the bones of large animals, of varieties now extinct, such as the elephant, rhinoceros, and cave bear. Such remains were found not many years ago, including a magnificent skull, when builders were enlarging the office of a London newspaper in Fleet Street.

Below this we should come to the London clay, as it is called, containing remains of strange cattle, remains of turtles, palms, and large tropical fruits, with shell-fish like those we see now only in tropical regions. When that bed was forming, we understand, these regions were tropical. Below the London clay we come to the chalk. Creta is the Latin for chalk, and the proper name for this chalk is the *cretaceous* layer. Here we find the giant reptiles, and some reptiles that flew in the air and teach us where the birds have come from.

As we went farther down, we should find other remains of lower types, shells and remains of early fishes. The lower we went, the greater would be the difference between the living forms of which we found the remains and those that live now. After a time remains would become very few and simple, and lastly we should come upon layers which yielded no evidence of life, and, indeed, which correspond to a time when there was no life upon the earth, and when its crust was still in the fiery condition which we have studied under astronomy. Of course, we must not imagine that all over the earth we find a perfectly regular arrangement of layers without breaks. Here we have been describing



A SLICE OF THE EARTH'S CRUST

If we could cut a slice from the earth's crust it would look something like this. First we find remains of present-day animals, and stone weapons used by the early men.

Then we find the remains of the mammoth, the great Irish elk, and the woolly rhinoceros, which lived when the greater part of our earth was covered with mighty glaciers.

Next we find fossil bones of huge animals like the giant sloth, and of smaller creatures like the ancestor of our modern horses, that lived a million years ago.

In this section we see the remains of the mighty mastodon, and a tiger with teeth as large as walrus tusks. Elsewhere in this book we see what all these fossils were like when they were alive,

Then we come to the chalk rocks, with their giant reptiles, their great flying dragons, and the remains of birds, which first began to appear in this age, perhaps three or four million years ago.

Lower down, the rocks contain remains of the gigantic "fish-lizards," with necks like snakes, that lived in the Age of Reptiles, six or seven million years ago.

Next we come to the carboniferous rocks, with their remains of mighty forests that have become coal, in the fifteen or twenty million years since they grew. Crocodiles appear in these rocks.

Still lower, we have the remains of fishes which existed when nearly all living creatures dwelt in the sea.

Below this are also fishes, including the first vertebrates, or back-boned animals.

Lower still are various shell creatures, and seaweeds, of thirty million years ago.

Finally, we have the first traces of living creatures; with the hard rocks formed by fire, lowest of all.

them in order to get a view of what they teach us regarding life; but many accidents and breakages have happened, so that we find the layers mixed up in many places. We may find places where we come to layers of quite another kind, and where there has actually been a crack, on one side of which the earth has been heaved up, or has fallen down. When men are seeking coal, or gold, or something of the kind under the ground, it is very annoying to come to places like this. They are called "faults" by men who study geology.

But such places teach us something of what an earthquake means, and terrible instances like the Italian earthquake show that from these cracks and violent disturbances of the crust of the earth there may follow consequences so great that the map of such places may be greatly changed. Sicily, for example, in consequence of an earthquake like that which has recently taken place, might possibly become joined by dry land to Italy. We may say that this looks as if it were a contradiction of what we began with—the great lesson that the earth's history is made by small things. But what makes the earthquake? It is the small, slow, sure processes that are always going on. We live on a hot ball, the interior of which is slowly losing its heat and shrinking. The crust which is supported on this interior is constantly having its support drawn away from under it. So it must fall and follow. When an apple shrinks, the skin must follow, and so the skin becomes wrinkled. It is possible that mountain ranges are in part produced by this wrinkling of the earth's skin as the interior shrinks. Also the crust gives way at various places. It may do this very suddenly, just as a steel rod may give way all in a moment, though it does so because it has been slowly rusting for months. Hence the earthquakes that produce great results very suddenly are themselves the results of the slow age-long forces which really make the history of the earth's crust. As these forces go on working, the crust may seem to rise or sink here or there; water and dry land change places, sometimes in a moment—the disappearance of an island has actually been photographed—but more often by processes that leave no outward sign save in hundreds of years. If there is any one idea that we should have in our minds and always keep there about the earth's crust and the whole science that is called geology, it is that geology is not simply a record of a past process that has now come to an end but that the forces which have made the past history of the earth are still at work. We are in a stage, just as creatures that lived five or ten million years ago were in a stage. They were on the surface then, we are on the surface now. Boston has more than once been at the bottom of the sea and will doubtless be there again. There is nothing permanent in boundaries or frontiers, whether made by water or by mountains. The one thing that may outlast the United States or the Himalayas is the human mind, and the truths and beauties that it can discover and imagine. These are the only kind of legacy that we can hope to hand down to remote ages of men, who may live on some new continent which is now beneath the ocean's waves, and may sail in their ships over what once was Great Britain, but will still know and honor the names of Shakespeare and Milton and Newton and Harvey and Darwin.

A fossil fish that lived more than two million years ago.

THE NEXT PART OF THIS IS ON PAGE 3031.

The Book of SCHOOL LESSONS

WORDS USED IN THE PLACE OF NOUNS

CONTINUED FROM 2697

SO far we have only learned two kinds of words. First, words that are names of people or things, like BOY, DUCK, KING, SHEPHERD; and, second, words that tell us something about people or things, like GOOD, TALL, BLACK. Do you remember what these two kinds of words are called? It does not matter very much whether you remember or not, as long as you know the difference between these words when you see them. But when you grow up and go to school (though, perhaps, you do go to school already) you will have to learn to call the first kind NOUNS, and the second kind ADJECTIVES.

Now let us pretend again. Suppose someone came to you and said: "Please tell me a story — tell me a story about BOYS and GIRLS and FAIRIES and WOODS and LIONS and TIGERS and CAKE and GINGERBREAD and INDIANS, and all sorts of things." Now, how would you begin to tell a story that would please the person who asked you? Well, of course, you would begin with "Once upon a time," or else it would not be a proper story. And then you would go on something like this: "Once upon a time there lived a little boy, and HE had a little sister. SHE was always happy when SHE was playing with HIM, and THEY used to have such jolly times together. One day THEY went into a wood WHICH was behind their father's house. Now, the wood was full of lions and tigers and Indians, and all sorts of awful things; but the good fairies took the brother and sister by the hand and led THEM along quite safely, till THEY came to a little house. What was their surprise to see that IT was made of cake and gingerbread, and all the windows were barley-sugar."

Now stop for a minute to take breath, and look back at the story that you are supposed to be telling. Do you see the little words that are printed in big capital letters? They are such little words, and yet they are very, very useful. Suppose there were not any of those little words; then see how much longer and more clumsy the story would have been. You would have had to say something like this: "Once upon a time there lived a little boy, and the little boy had a little sister. The little sister was always happy when the little sister was playing with the little boy; and the little boy and the little sister used to have such jolly times together. (Is it not getting dreadful?) One day the little boy and the little sister went into a wood, and the wood was behind their father's house."

And so we should have to go on, using these long words over and over again instead of the nice short, easy ones that we used at first. Now, these little words, HE, SHE, IT, THEY, WHICH, are used instead of nouns, for nouns, and so they are called "for-nouns," only we like to seem clever and learned, and so we use the Latin word for "for," and that is PRO. So instead of calling them FOR-NOUNS, we call them PRO-NOUNS.

When I was at school I used to learn a little rhyme:

A PRONOUN is a word used instead of a
NOUN,
As, James was tired and HE sat down.

But I like the next one better, because it is less like a grammar book:

HE, SHE, IT went out to tea,
And ate of tea-cakes not a few:
When asked their names, said, "WE are
WE,
As sure as YOU are YOU."

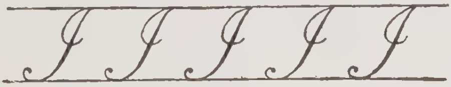
HE, SHE, IT had cousins too,
But did not take them out that day:
When asked, "How do your cousins do?"
Replied, "Oh, THEY are THEY!"

WRITING

CAPITAL I, J, C, E, AND G

"WE know fifteen letters, mother," said Nora, when she and Tom next sat down to their writing lesson. "That is more than half."

"And I hope we shall learn five more to-day," replied her mother. "Small i was easy to make, and capital I is easy. In writing letters to friends we often want to use it, for most letters have I in them somewhere; so we must make it well."



"Let the pen start making the loop between the two lines; bring it lightly round and up to the right, and then make a heavier down-stroke like that of T or F, or the first part of H or K. Now, Tom, see which of those four letters is most like I."

Tom looked at all five letters, and soon saw that T with the turn, not T like the T-square, was most like I.

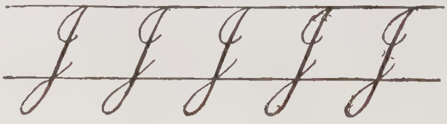
"But," said he, "T has a turn, and I has a loop. How can we remember, Nora?"

Nora put on her thinking-cap, and puzzled over it, till, happening to look down at her sleeve, she noticed a hook fastening it at the wrist by a loop made of cotton, not by an eye.

"Yes, Nora; that's it!" exclaimed her mother. "The eye has a loop."

"Now we shall know," said Tom, as he looked at Nora's sleeve, and saw that the loop bulged out like the curve of I from the down-stroke.

After practising the loop of I, the children were shown how to make its brother letter, a grown-up brother letter, as the children soon discovered.



"I has been growing a tail. Look! A tail like that of Y and Z."

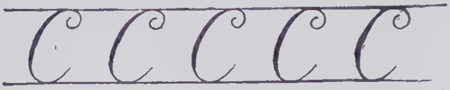
Nora and Tom looked, and asked what the letter was.

"Cousin Jack's letter," said their mother. "What do you think 'Jack' should begin with?"

Nora thought it must be J, because it sounded so like it, and she was quite right.

"And J comes next to I in the alphabet, you know, Nora," said Tom.

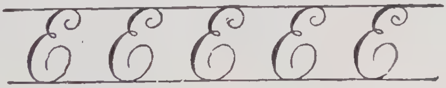
"You can think of I grown up into J with a tail," observed his mother. "There is a bird called a jay, which learns to talk like a parrot. As it has a tail, too, that will help in remembering J's tail. Here is a letter easy to recognize. What is it ?" she asked, when the children had finished J, and she was writing C for them to copy.



Tom and Nora had hardly need to do more than glance at it. They knew it must be C, because it was so like little c, only, as Tom said, instead of starting at once with a little dot, it made a curled-up little tail to look more important, for it had to do something to show it was not a little c, but a big one.

Their mother said they must make it double the height of the little letter c, so that then it could not be confused with the small letter.

" Now," she said, when the children had finished writing it, " the next letter is a pretty one, full of curves, but it needs special care to make because it has so many turns. It is E."

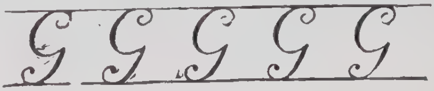


" What is the figure which is the same as a stroke, Tom ? "

Tom answered " 1," and his mother, holding up a piece of looking-glass so that E was reflected in it, asked, " And what is this ? "

" Why, mother, it is a 3 ! " exclaimed Nora. " But only in the looking-glass," she added, as she and Tom began to copy their mother's letters.

They were shown how the upper curve started on the right below the upper line, went up and round to the left, and round and down to the right, and then repeated a bigger curve under the upper one, so that it had a curve above and a curve below. It wanted care to make the upper and lower parts nicely rounded, but when Tom and Nora had practised making it they were shown the fifth letter, G. Here it is :



" G," said their mother, " begins in the same way as E, but makes a bigger loop, and ends quite differently by a down-stroke which curves round to the left and ends in a dot. There is another way of making it, but this one is simple. Look at it well before beginning."

Tom and Nora knew by this time that if they did not look carefully first they were very likely indeed to make mistakes, so they had a good look at G before they set to work to copy it.

ARITHMETIC

THE WAY TO MULTIPLY BIG NUMBERS

ALTHOUGH we have learned to speak of " multiplying a number by 3," we must always remember that this is simply a short way of saying that we " add together three equal numbers." In writing the problem we write the number itself *once*, and the *multiplier* shows how many of these numbers we are adding together.

If I have 5 bags, and each bag contains 136 nuts, how many nuts have I altogether ?

Here we have to find what the result would be if we wrote the number 136 five times, and added the five numbers together. To find this, we write 136 only *once*, and the *multiplier* 5, written under the unit's figure of 136, shows that we are adding *five* numbers, each of which is 136. Let us work it.

```
136
  5
———
680
```

Say, five 6's, 30 ; put down 0, carry 3. Five 3's, 15, and 3, 18 ; put down 8, carry 1. Five 1's, 5, and 1, 6 ; put down 6.

Multiplication by any of the numbers from 2 to 9 is done in the same way as the examples we have already worked. We ought not to find any difficulty about it, since the process is just like addition ; we find first what the units make, then the tens, and so on.

We now come to another important point. Suppose 4 children have 5 apples each. Altogether, there will be 4 times 5 apples. Next, if each of the children gives one of his apples to a fifth child, they will each have 4 apples left, and the fifth child will also have 4 apples.

Thus, we now have 5 children each

with 4 apples, so that, altogether, there are 5 times 4 apples. But, in all, there are just as many apples as there were before; so it is clear that

"Five times 4" is the same as "4 times 5."

The use of knowing this is seen in a question like the following:

A blacksmith uses 7 nails to fasten a horse-shoe. How many nails will he use to fasten 248 horse-shoes?

Evidently he will require 7 nails 248 times—that is, we want to know how many 248 times 7 make. At present this would perhaps be difficult to us; but when we remember that "248 times 7" is the same as "7 times 248" it is quite easy, because we know how to multiply 248 by 7. If we work this, we find the blacksmith requires altogether 1736 nails.

EXAMPLES

1. A market-gardener plants 254 cabbage-plants every day for 6 days. How many is that altogether?

2. Two hundred and fifty-seven boys each do 8 lines of writing. How many lines do they do altogether?

3. Forty-three girls have 5 pennies each, and 29 boys have 7 pennies each. How many pennies is that altogether?

First find how many the girls have, then how many the boys have, and add the two numbers together.

4. Multiply seven thousand two hundred and nine by nine, and write out the answer in words.

5. If 243 boys each have 3 marbles in one hand and 4 in the other, how many marbles have the boys altogether?

Let us multiply the number 34 by 10. If we use the same method as we have done for the numbers up to 9, we shall have:

34 Ten 4's, 40, carry 4.
10 Ten 3's, 30, and 4, 34.
——
340

So that the answer is 340.

Now, 340 and 34 are very much alike. They each have a 3, followed by a 4. Then one of them has 0 following the 4.

Suppose we try to find the reason these numbers are so much alike.

$\boxed{}\ \boxed{3}\ \boxed{4}$

Using our "boxes" again for a while, the number 34 means that we have 4 things in the right-hand, or units, box, and 3 bundles of them in the tens box. Now, if we multiply this number by 10—that is, if we add together ten 34's—each "one" becomes a bundle of ten, each "ten" becomes "ten bundles of ten," or what we call a hundred. Thus, instead of 3 tens and 4 ones, we have 3 hundreds and 4 tens. Putting these into their proper boxes, we get a 3 on the hundreds box, a four on the tens box, and a 0 on the units box.

$\boxed{3}\ \boxed{4}\ \boxed{0}$

We see, then, that *to multiply a number by* 10 *we have only to put a* 0 *at the right of it.* For this means that the figure which stood for "ones" now stands for "tens," the figure which stood for "tens" now stands for "hundreds," and so on—that is, the number is ten times what it was

For example, 5894 multiplied by 10 is 58940.

320 multiplied by 10 is 3200.

THE ANSWERS TO THESE EXAMPLES ARE GIVEN ON PAGE 3170.

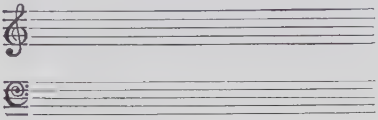
MUSIC

THE MAP WHICH THE FAIRIES MADE

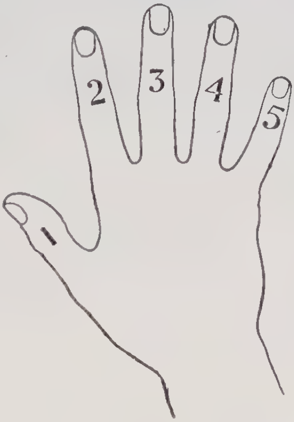
WE now know where all our fairies and goblins live; we know their names, and we know how to make each one sing his or her little song; but sometimes two, or three, or four, or even more want to sing together.

And long ago the question arose in fairyland: "How can we make it possible for the children to see at a glance how to press down two, three, four, or even more of our little notes at the same time?"

At last one of the little goblins spoke words of wisdom, and this is what he said: "Fairies and goblins all, we know that the Treble Road and the Bass Road appear as one very long line to the child who comes to see us in our magic kingdom, the piano. To look all along that line in a passing second of time would be very difficult, and many signs would be wanted to show that those of us in the Treble Road are wanting to sing with our friends in the Bass Road. The only easy thing to do is to give everyone a curious sort of map, which we in fairyland know how to make. It will look as if the Treble Road were over the Bass Road, and as if the Bass Road lay under the Treble Road, just like this :

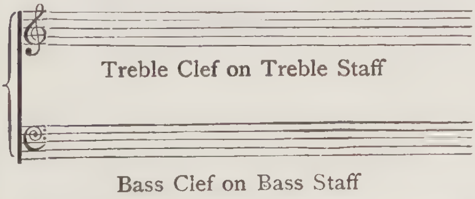


" Of course, as you see, Treble Clef must stand at the entrance of the Treble Road (or Treble Staff, as we know it is called), and Bass Clef must take up his stand at the entrance of the Bass Road. To show there is a reason for this curious map, and to tell the children of earth that the fairies and goblins in each road are going to give beautiful choruses instead of little solos, we must give them a new sign, like this : { It joins the roads together, and the children of men will call it a *brace*. So will they know that they must be clever enough to use two hands, and approach different notes with them at the same time."

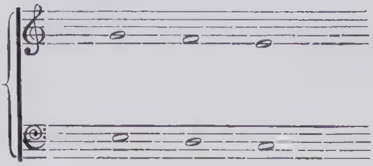


How we number our fingers.

All the fairies and goblins thought this was a very clever idea, and they clapped their little hands, and fluttered their small wings, so that all who had "fairy ears" heard the most beautiful music, so exquisite that we can hardly imagine how really wonderful it was. This is the fairy map which has been made for you and me :

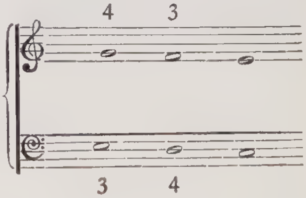


If we wait a little while longer, we shall see the fairies have taken up their places on the lines and in the spaces. Yes, here they are :

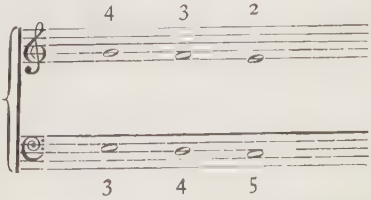


You see, Fairy G on the second line in the Treble Road and Fairy E in the third space in the Bass Road want to sing together ; so find Fairy G with the fourth finger on your right hand, and Fairy E with the third finger on your left hand, then press down very firmly, but gently, *quite together*, and we shall hear how nicely their voices blend. In case you are a little puzzled about the fingers of your hand, there is a picture on this page with the fingers all marked, so that it may be quite easy to make no mistakes.

Now we look at the next two notes :



F in the first space in the Treble Road wants to sing with D on the third line in the Bass Road. Again we must find our fairies, and we want the third finger on the right hand and the fourth finger on the left hand ; but we must approach them carefully, mind that they sing exactly together, and I know we shall think how very nice they both are. Just two more fairies left, and they are very anxious for us to hear them :

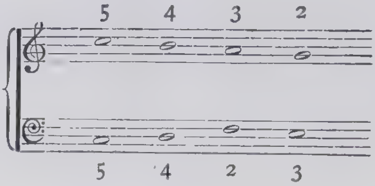


Fairy E on the first line in the Treble Road, waiting for the second finger of the right hand; Fairy C in the second space in the Bass, waiting for the fifth finger of the left hand.

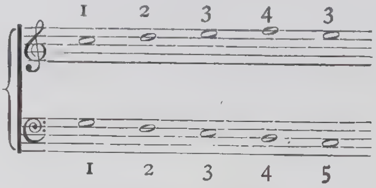
Do you not think it would be nice to play one or two games like this last one, so that we can see how quickly fairies can be found, even when they live in different roads, and how little time we need lose in thinking which fingers we want to use?

The merriest way to play our game is to make up our minds to find fairies and fingers by the time we have counted four, taking care to find the right ones.

THE FIRST GAME



THE SECOND GAME

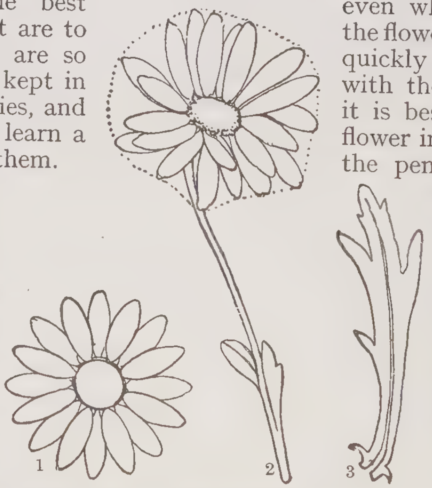


DRAWING

DRAWING AND PAINTING A DAISY

NOW that we know something about color and a little about pencil outline from plants, and about designing or making patterns, we will try and use all these together. We must remember that it is best to take simple things to copy, and to use only a few colors till we have grown clever with brush and pencil. It is better not to copy anybody else's drawings till we are big enough to go to places where only the best pictures and the best sculpture and ornament are to be seen; these things are so valuable that they are kept in museums and art galleries, and people who copy them learn a great deal that helps them.

The great artists who did this wonderful work were once little children who found straight lines and curves very difficult, and sometimes so tiresome that they felt inclined to give up. But they would not let themselves be beaten; they drew the things they saw all around them every day, taking the easy ones first, till they made pictures at which thousands of people still love to look, as they hang on the walls of our picture-galleries.



Pictures 2 and 3 show the daisy drawn from nature; 1 gives the "conventional" drawing.

Let us get a flower with its leaves and buds, and our paints, and white and brown paper. We will try to copy the flowers first, using white paint for the flower and black for the leaves and stalks, painting it in as many different positions as possible. If we like, we can do it all in black paint on white paper, just to get an idea of the flower.

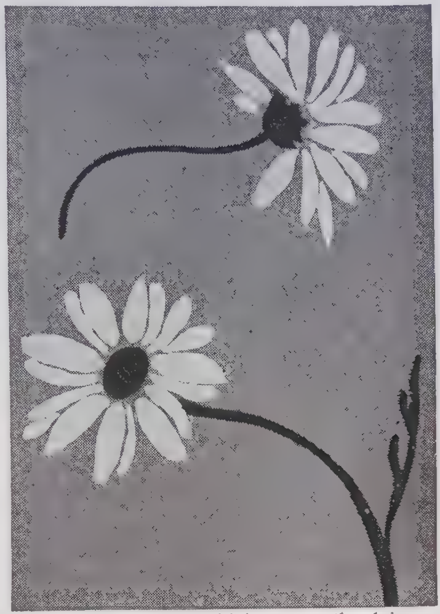
Flowers and leaves change so quickly that we have to work partly from memory even while we are looking at the flower. We can brush more quickly with the brush than with the pencil; that is why it is best to get to know the flower in brushwork first. For the pencil drawing, we must sketch in the general outline first, and not alter this at all till we come to finishing the drawing with a clear outline. If the flower changes so much that we cannot finish the first sketch, we must begin another.

Suppose we have managed the general outline—as it is shown in the dotted line in the illustration—sketching it in with the chisel-pointed pencil; we can then put in the yellow centre. Unless we are looking full at the flower, the circle in the centre will alter as the jam-jar did; it will be oval—narrower as it comes near the level of the eye. The general outline has been drawn round the points of the white rays, which are also set in a circle, and this will narrow or widen as the centre one did, according to its nearness to or distance from the eye-level.

We will put in the principal white rays first, and then the others. Some are behind each other; some look shorter than others. We must look at each one carefully first before we draw it.

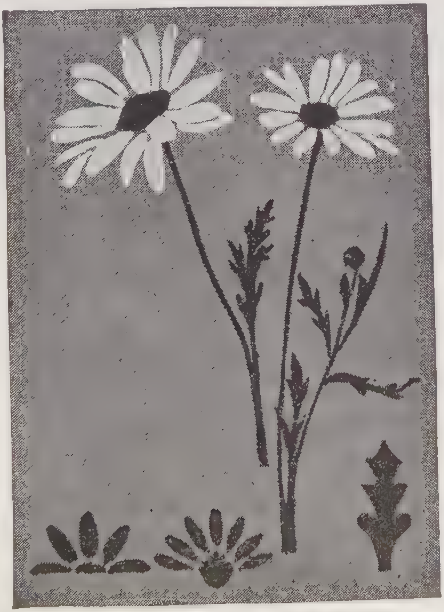
As soon as we have made a nice drawing, we can rub out the working lines, and put in the lines we want to keep with a sharp-pointed pencil to give a good, clear outline. The lines for the stalk, the leaves, and the centre should be stronger than those for the white rays, but none of them should be heavy.

Now let us put all our drawings and the flowers away, and do some others from memory; then we can see how much we have remembered. Afterwards we will make what are called "conventional drawings" of the flower and leaves and buds. We get our idea from Nature, but we make rather stiff drawings with both sides alike, for we want this sort of drawing for decoration. In the ivy leaf we found a five-cornered shape. The proper name for that shape is pentagon, which means five corners. The daisy has a circle for its conventional shape. It looks nice in the middle of a square; but the corners must be filled up with leaves or buds, so that if the square outline were taken away we could still see that the pattern was meant for a square. Let us draw a little square tile, with each of its sides three inches long, and put a circle for the daisy of one inch and a half radius in the middle. We find the middle of a square by drawing lines from corner to corner. Then we can put in the daisy and leaves in the spaces, and paint the tile in three colors—yellow, orange, and green, leaving the flower of white.



Some positions in which we see the daisy.

As the flower is to be left white, the background must be painted. This is the most difficult part of the painting, and must always be done first; great care must be taken to keep the wash of color quite flat and to keep the edges of the pattern clean. We must remember that perfection only comes with practice, and that, though it is difficult, it can be done very nicely even by quite little children. We must keep trying, and take every chance we can of going to places where we can see other people's work, and if other little girls and boys are doing this drawing too, it will help us both to see each other's work, for we learn much by the mistakes of others.



The daisy and its leaves.

LITTLE PICTURE-STORIES IN FRENCH

First line: French. Second line: English words. Third line: As we say it in English.

Il pleut. Nous irons acheter des cadeaux pour les prendre chez nous.
It rains. We shall go to buy some presents for them to take to the house of us.
It is raining. We are going to buy presents to take home.

Nous trouvons nos parapluies, et nous sortons. Nous traversons la rue.
We find our umbrellas, and we set out. We traverse the street.
We find our umbrellas, and start out. We cross the street.

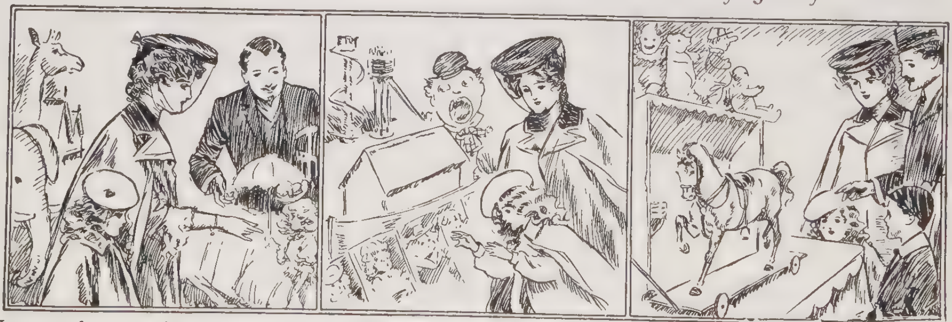
Il y a un magasin dans la prochaine rue où l'on vend de beaux joujoux.
It there has a shop in the next street where (the) one sells some beautiful toys.
There is a shop in the next street where beautiful toys are sold.

Nous entrons tous. Le commis dit : " Qu'est-ce que madame désire ? "
We enter all. The shopman says : " What is this that madam desires ? "
We all go inside. The shopman says : " What can I do for you ? "

" Nous désirons acheter des cadeaux. Combien coûte cette poupée ? "
" We desire to buy some presents. How much costs this doll ? "
" We wish to buy some presents. How much is this doll ? "

" Quinze francs, madame." " C'est trop. Montrez-moi d'autres poupées."
" Fifteen francs, madam." " That is too much. Show me some other dolls."
" Fifteen francs, madam." " It is too much. Show me some others."

" Puis-je avoir celle-ci dans la robe bleue pour la cousine Elsie ? " dit Jeannette.
" May I to have this here in the robe blue for the cousin Elsie ? " says Jenny.
" May I have this one in the blue frock for cousin Elsie ? " says Jenny.



Nous achetons la poupée, et je choisis des soldats pour mon ami Jean.
We buy the doll, and I choose some soldiers for my friend John.
We buy the doll, and I choose some soldiers for my friend John.

Puis nous choisissons des chaises pour la maison de poupées d'Annette.
Then we choose some chairs for the house of dolls of Annette.
Then we choose some chairs for Annette's dolls' house.

" Il fait du soleil," dit Jeannette. " Allons nous promener."
" It makes of the sun," says Jenny. " Let us go ourselves to promenade."
" The sun is shining," says Jenny. " Let us go for a walk."

THE NEXT SCHOOL LESSONS BEGIN ON PAGE 3167.

THE POETRY OF SHAKESPEARE

As William Shakespeare, the greatest of all poets, wrote chiefly for the stage, his poetry taking the form of great dramatic pieces to be spoken and acted on the stage, we find in his works few short complete poems. Though he did not write for children, his plays may be enjoyed by old and young alike, and we have already read the stories of many of these, beginning at page 327. Here we give a selection of songs from his plays, and some passages from these which are suitable for the "Book of Poetry." Ariel's song from "The Tempest" is on page 331.

SONGS FROM SHAKESPEARE

CONTINUED FROM 2826

THE FAIRY LIFE

From "A Midsummer Night's Dream."

Over hill, over dale,
Through bush, through brier,
Over park, over pale,
Through flood, through fire,
I do wander everywhere,
Swifter than the moon's sphere;
And I serve the fairy queen,
To dew her orbs upon the green;
The cowslips tall her pensioners be;
In their gold coat spots you see;
Those be rubies, fairy favours,
In those freckles live their savours;
I must go seek some dewdrops here,
And hang a pearl in every cowslip's ear.

A WINTER SONG

From "Love's Labour's Lost."

When icicles hang by the wall,
And Dick the shepherd blows his nail,
And Tom bears logs into the hall,
And milk comes frozen home in pail,
When blood is nipp'd, and ways be foul,
Then nightly sings the staring owl,
To-who;
Tu-wit, to-who, a merry note,
While greasy Joan doth keel the pot.

When all aloud the wind doth blow,
And coughing drowns the parson's saw,
And birds sit brooding in the snow,
And Marian's nose looks red and raw,
When roasted crabs hiss in the bowl,
Then nightly sings the staring owl,
To-who;
Tu-wit, to-who, a merry note,
While greasy Joan doth keel (cool) the pot.

UNDER THE GREENWOOD TREE

From "As You Like It."

Under the greenwood tree
Who loves to lie with me;
And tune his merry note
Unto the sweet bird's throat,
Come hither, come hither, come hither;
Here shall he see
No enemy,
But winter and rough weather.

Who doth ambition shun,
And loves to live i' the sun;
Seeking the food he eats,
And pleased with what he gets,
Come hither, come hither, come hither;
Here shall he see
No enemy,
But winter and rough weather.

THE WINTER WIND

From "As You Like It."

Blow, blow, thou winter wind,
Thou art not so unkind
As man's ingratitude;
Thy tooth is not so keen,
Because thou art not seen,
Although thy breath be rude.
Heigh-ho! sing heigh-ho! unto the green holly:
Most friendship is feigning, most loving mere folly:
Then, heigh-ho, the holly!
This life is most jolly.

Freeze, freeze, thou bitter sky,
That dost not bite so nigh
As benefits forgot;
Though thou the waters warp,
Thy sting is not so sharp
As friends remembered not.
Heigh-ho! sing heigh-ho! unto the green holly:
Most friendship is feigning, most loving mere folly:
Then, heigh-ho, the holly!
This life is most jolly.

A FAIRY LULLABY

From "A Midsummer Night's Dream."

You spotted snakes, with double tongue,
Thorny hedgehogs, be not seen;
Newts and blind-worms, do no wrong;
Come not near our fairy queen.
Weaving spiders, come not here;
Hence, you long-legg'd spinners, hence;
Beetles black approach not near;
Worm, nor snail, do no offence.
Philomel, with melody,
Sing in our sweet lullaby:
Lulla, lulla, lullaby, lulla lulla, lullaby:
Never harm, nor spell, nor charm,
Come our lovely lady nigh;
So, good-night with lullaby.

ORPHEUS AND HIS LUTE

From "King Henry VIII."

Orpheus with his lute made trees,
And the mountain-tops that freeze,
Bow themselves when he did sing:
To his music, plants and flowers
Ever sprung; as sun and showers
There had made a lasting spring.

Everything that heard him play,
Even the billows of the sea,
Hung their heads, and then lay by.
In sweet music is such art,
Killing care and grief of heart
Fall asleep, or hearing, die

THE FALL OF CARDINAL WOLSEY

ONE of the greatest characters in the long roll of English history is Cardinal Wolsey, who was the foremost man in the kingdom during the earlier reign of King Henry VIII. He was a tyrant, unjust in many ways, but a patriot for all that ; and when the king dismissed him from his high office, it is thus that Shakespeare, in the play of " King Henry VIII.," imagines him to have received the crushing blow. The Cromwell mentioned is not Oliver Cromwell, of course, as he lived later, but Wolsey's secretary.

WOLSEY : Farewell, a long farewell, to all my greatness !
This is the state of man ; to-day he puts forth
The tender leaves of hope ; to-morrow blossoms,
And bears his blushing honours thick upon him :
The third day comes a frost, a killing frost ;
And—when he thinks, good, easy man, full surely
His greatness is a-ripening—nips his root.
And then he falls, as I do. I have ventured,
Like little wanton boys that swim on bladders,
This many summers in a sea of glory ;
But far beyond my depth : my high-blown pride
At length broke under me ; and now has left me,
Weary, and old with service, to the mercy
Of a rude stream, that must for ever hide me.
Vain pomp, and glory of this world, I hate ye ;
I feel my heart new opened : O, how wretched
Is that poor man that hangs on princes' favours !
There is, betwixt that smile we would aspire to,
That sweet aspect of princes, and their ruin,
More pangs and fears than wars or women have ;
And when he falls, he falls like Lucifer,
Never to hope again.

Enter Cromwell.
Why, how now, Cromwell ?

Cromwell : I have no power to speak, sir.

Wolsey : What, amazed
At my misfortunes ? Can thy spirit wonder
A great man should decline ? Nay, an you weep,
I am fallen indeed.

Cromwell : How does your Grace ?

Wolsey : Why, well ;
Never so truly happy, my good Cromwell.
I know myself now ; and I feel within me
A peace above all earthly dignities,
A still and quiet conscience. The king has cured me,
I humbly thank his Grace ; and from these shoulders,
These ruin'd pillars, out of pity, taken
A load would sink a navy, too much honour ;
O, 'tis a burden, Cromwell, 'tis a burden,
Too heavy for a man that hopes for heaven.

. . . .

Go, get thee from me, Cromwell ;
I am a poor fallen man, unworthy now
To be thy lord and master : Seek the king ;
That sun, I pray, may never set ! I have told him
What, and how true thou art : he will advance thee ;
Some little memory of me will stir him
(I know his noble nature), not to let
Thy hopeful service perish too. Good Cromwell,
Neglect him not ; make use now, and provide
For thine own future safety.

Cromwell : O, my lord,
Must I then leave you ? Must I needs forego
So good, so noble, and so true a master ?
Bear witness, all that have not hearts of iron,
With what a sorrow Cromwell leaves his lord.
The king shall have my service ; but my prayers
For ever and ever shall be yours.

Wolsey : Cromwell, I did not think to shed a tear
In all my miseries ; but thou hast forced me,
Out of thy honest truth, to play the woman.
Let's dry our eyes : and thus far, hear me, Cromwell ;
And—when I am forgotten, as I shall be ;
And sleep in dull, cold marble where no mention
Of me more must be heard of—say, I taught thee,
Say, Wolsey—that once trod the ways of glory,
And sounded all the depths and shoals of honour—
Found thee a way, out of his wreck, to rise in ;
A sure and safe one, though thy master miss'd it.
Mark but my fall, and that that ruin'd me.
Cromwell, I charge thee, fling away ambition :
By that sin fell the angels ; how can man, then,
The image of his Maker, hope to win by't ?
Love thyself last : cherish those hearts that hate thee ;
Corruption wins not more than honesty.
Still in thy right hand carry gentle peace,
To silence envious tongues. Be just and fear not.
Let all the ends thou aim'st at be thy country's,
Thy God's, and truth's ; then if thou fall'st, O Cromwell,
Thou fall'st a blessed martyr. Serve the king ;
And—prythee, lead me in :
There take an inventory of all I have,
To the last penny ; 'tis the king's : my robe,
And my integrity to heaven, is all
I dare now call mine own. O Cromwell, Cromwell,
Had I but served my God with half the zeal
I served my king, He would not in mine age
Have left me naked to mine enemies.

THE GREAT SPEECH OF MARK ANTONY

THIS is one of the most famous speeches written by Shakespeare, in whose plays there are many fine speeches. It is spoken by Antony, the friend of Julius Cæsar, over the dead body of that Roman ruler after the plot to murder Cæsar had been carried out. Antony sought to regain the people to the side of Cæsar's friends. The play is called "Julius Cæsar."

FRIENDS, Romans, countrymen, lend me your ears;
I come to bury Cæsar, not to praise him.
The evil that men do lives after them;
The good is oft interred with their bones;
So let it be with Cæsar. The noble Brutus
Hath told you Cæsar was ambitious:
If it were so, it was a grievous fault;
And grievously hath Cæsar answer'd it.
Here, under leave of Brutus, and the rest,
(For Brutus is an honourable man;
So are they all, all honourable men):
Come I to speak in Cæsar's funeral.
He was my friend, faithful and just to me;
But Brutus says he was ambitious,
And Brutus is an honourable man.
He hath brought many captives home to Rome,
Whose ransoms did the general coffers fill:
Did this in Cæsar seem ambitious?
When that the poor have cried, Cæsar hath wept;
Ambition should be made of sterner stuff:
Yet Brutus says he was ambitious,
And Brutus is an honourable man,
You all did see, that on the Lupercal,
I thrice presented him a kingly crown,
Which he did thrice refuse. Was this ambition?
Yet Brutus says he was ambitious;
And, sure, he is an honourable man.
I speak not to disprove what Brutus spoke,
But here I am to speak what I do know.
You all did love him once, not without cause;
What cause withholds you, then, to mourn for him?
O judgment, thou art fled to brutish beasts,
And men have lost their reason! Bear with me;
My heart is in the coffin there with Cæsar,
And I must pause, till it come back to me.

. . . .

But yesterday, the word of Cæsar might
Have stood against the world: now lies he there,

THE FRIEND OF THE DEAD CÆSAR PRAISING HIM TO THE ROMANS

After Julius Cæsar had been killed, the conspirators explained their action to the people. Brutus spoke and the mob was pleased. Then Antony, the friend of Cæsar, praised the murdered ruler and showed his body. The people now turned to Antony's side, and here we see Brutus and Cassius—who wears a helmet—turning away from the angry people. The picture is by the French artist Court, photographed by Neurdein.

And none so poor to do him reverence.
O masters, if I were disposed to stir
Your hearts and minds to mutiny and rage,
I should do Brutus wrong, and Cassius wrong,
Who, you all know, are honourable men:
I will not do them wrong; I rather choose
To wrong the dead, to wrong myself, and you,
Than I will wrong such honourable men.
But here's a parchment, with the seal of Cæsar,
I found it in his closet, 'tis his will:
Let but the commons hear this testament,
(Which, pardon me, I do not mean to read),
And they would go and kiss dead Cæsar's wounds,
And dip their napkins in his sacred blood;
Yea, beg a hair of him for memory,
And, dying, mention it within their wills,
Bequeathing it, as a rich legacy,
Unto their issue.

. . . .

If you have tears, prepare to shed them now.
You all do know this mantle: I remember
The first time ever Cæsar put it on;
'Twas on a summer's evening, in his tent;
That day he overcame the Nervii:
Look! In this place ran Cassius' dagger through:
See, what a rent the envious Casca made:
Through this the well-beloved Brutus stabb'd;
And, as he pluck'd his cursed steel away,
Mark how the blood of Cæsar follow'd it;
As rushing out of doors, to be resolv'd
If Brutus so unkindly knock'd, or no;
For Brutus, as you know, was Cæsar's angel:
Judge, O you gods, how dearly Cæsar loved him!
This was the most unkindest cut of all;
For when the noble Cæsar saw him stab,
Ingratitude, more strong than traitors' arms,
Quite vanquished him: then burst his mighty heart;
And, in his mantle muffling up his face,
Even at the base of Pompey's statue,
Which all the while ran blood, great Cæsar fell.
O, what a fall was there, my countrymen!
Then I, and you, and all of us fell down,
Whilst bloody treason flourish'd over us.
O, now you weep; and, I perceive, you feel
The dint of pity: these are gracious drops.
Kind souls, what, weep you, when you but behold
Our Cæsar's vesture wounded? Look you here,
Here is himself, marr'd, as you see, with traitors.
Good friends, sweet friends, let me not stir you up
To such a sudden flood of mutiny.
They that have done this deed are honourable;
What private griefs they have, alas, I know not,
That made them do it; they are wise and honourable,
And will, no doubt, with reasons answer you.
I come not, friends, to steal away your hearts;
I am no orator, as Brutus is:
But, as you know me all, a plain, blunt man,
That love my friend; and that they know full well
That gave me public leave to speak of him.
For I have neither wit, nor words, nor worth,
Action, nor utterance, nor the power of speech,
To stir men's blood: I only speak right on;
I tell you that which you yourselves do know;
Show you sweet Cæsar's wounds, poor, poor dumb mouths,
And bid them speak for me. But were I Brutus,
And Brutus Antony, there were an Antony
Would ruffle up your spirits, and put a tongue
In every wound of Cæsar, that should move
The stones of Rome to rise and mutiny.

THE SHEPHERD'S HAPPY LIFE

IN the play of "King Henry VI.," the king, at the battle of Towton, is supposed to utter these thoughts, and no doubt many a king in time of trouble has envied his humblest subject. Shakespeare's power is seen in thus expressing the emotions of his characters.

O GOD! methinks it were a happy life,
To be no better than a homely swain;
To sit upon a hill, as I do now,
To carve out dials quaintly, point by point,
Thereby to see the minutes, how they run:
How many make the hour full complete,
How many hours bring about the day,
How many days will finish up the year,
How many years a mortal man may live.
When this is known, then to divide the times:
So many hours must I tend my flock;
So many hours must I take my rest;
So many hours must I contemplate;
So many hours must I sport myself;
So many days my ewes have been with young;
So many weeks ere the poor fools will yean;
So many years ere I shall shear the fleece.
So minutes, hours, days, weeks, months, and years,
Pass'd over to the end they were created,
Would bring white hairs unto a quiet grave.
Ah, what a life were this! how sweet! how lovely!
Gives not the hawthorn bush a sweeter shade
To shepherds, looking on their silly sheep,
Than doth a rich embroider'd canopy
To kings that fear their subjects' treachery?
O, yes, it doth: a thousand-fold it doth.
And to conclude—the shepherd's homely curds,
His cold, thin drink out of his leather bottle,
His wonted sleep under a fresh tree's shade;
All which secure and sweetly he enjoys,
Is far beyond a prince's delicates,
His viands sparkling in a golden cup,
His body couched in a curious bed,
When care, mistrust, and treason wait on him.

A GREAT DAY FOR ENGLAND

SHAKESPEARE'S plays are full of stirring scenes, noble deeds, and fine thoughts, though we cannot print many of these here, and not all would be understood by boys and girls. But every boy and girl loves a brave man, a fearless warrior, and Henry V. was such as Shakespeare shows him to us. In the play of "King Henry V.," the scene is the English camp at Agincourt, in France, just before the famous battle, described in Drayton's poem on page 2743. Some of Henry's generals are discussing the outlook, and the Earl of Westmoreland is wishing they had "but one ten thousand of those men in England, who do no work to-day," when the king himself comes up and says:

WHAT'S he that wishes so?
My cousin Westmoreland?—No, my fair cousin:
If we are marked to die, we are enough
To do our country loss; and if to live,
The fewer men, the greater share of honour.
God's will! I pray thee, wish not one man more.
By Jove! I am not covetous for gold;
Nor care I who doth feed upon my cost;
It yearns me not, if men my garments wear;
Such outward things dwell not in my desires;
But, if it be a sin to covet honour,
I am the most offending soul alive.
No, 'faith, my coz, wish not a man from England:
God's peace! I would not lose so great an honour,
As one man more, methinks, would share from me,
For the best hope I have. O, do not wish one more;
Rather proclaim it, Westmoreland, through my host,
That he who hath no stomach to this fight,
Let him depart; his passport shall be made,
And crowns for convoy put into his purse.
We would not die in that man's company,
That fears his fellowship to die with us.
This day is called the feast of Crispian:
He that outlives this day, and comes safe home,
Will stand a-tiptoe when this day is named,
And rouse him at the name of Crispian.
He that shall live this day, and see old age,
Will yearly on the vigil feast his friends,
And say to-morrow is Saint Crispian:
Then he will strip his sleeve, and show his scars,
And say, these wounds I had on Crispian's day.
Old men forget: yet all shall be forgot.
But he'll remember, with advantages,
What feats he did that day! Then shall our names,
Familiar in their mouths as household words—
Harry the King, Bedford and Exeter,
Warwick and Talbot, Salisbury and Gloster,
Be in their flowing cups freshly remember'd.
This story shall the good man teach his son;
And Crispin Crispian shall ne'er go by,
From this day to the ending of the world,
But we in it shall be remembered;
We few, we happy few, we band of brothers:
For he, to-day, that sheds his blood with me
Shall be my brother; be he ne'er so vile,
This day shall gentle his condition:
And gentlemen in England, now a-bed,
Shall think themselves accursed, they were not here;
And hold their manhood cheap, while any speaks,
That fought with us upon Saint Crispian's day.

THE NOBLEST ROMAN

From "Julius Cæsar."

Brutus was one of the Romans who leagued to kill Cæsar, but Antony, Cæsar's friend, is made to say these things of him after he is dead and defeated.

THIS was the noblest Roman of them all:
All the conspirators, save only he,
Did that they did in envy of great Cæsar;
He, only, in a general honest thought,
And common good to all, made one of them.
His life was gentle; and the elements
So mix'd in him, that Nature might stand up,
And say to all the world, *This was a man!*

THE LESSON OF THE HONEY BEES

From "King Henry V."

There are many useful lessons which we may learn by studying the lives of animals and insects. Here is what the honey bees can teach us, according to Shakespeare.

SO work the honey bees;
Creatures that, by a rule in Nature, teach
The act of order to a peopled kingdom.
They have a king, and officers of sorts:
Where some, like magistrates, correct at home;
Others, like merchants, venture trade abroad;
Others, like soldiers, armed in their stings,
Make boot upon the summer's velvet buds;
Which pillage they with merry march bring home
To the tent-royal of their emperor;
Who, busied in his majesty, surveys
The singing masons building roofs of gold;
The civil citizens kneading up the honey;
The poor mechanic porters crowding in
Their heavy burdens at his narrow gate;
The sad-ey'd justice, with his surly hum,
Delivering o'er to executors pale
The lazy, yawning drone.

IN PRAISE OF ENGLAND

From "Richard II."

THIS royal throne of kings, this scepter'd isle,
This earth of majesty, this seat of Mars,
This other Eden, demi-paradise;
This fortress, built by Nature for herself
Against infection, and the hand of war;
This happy breed of men, this little world;
This precious stone set in the silver sea,
Which serves it in the office of a wall,
Or as a moat defensive to a house,
Against the envy of less happier lands;
This blessed plot, this earth, this realm, this England.

From "King John."

This England never did, nor never shall,
Lie at the proud foot of a conqueror. . . .
Come the three corners of the world in arms,
And we shall shock them: Nought shall make us rue
If England to itself do rest but true.

A FATHER'S ADVICE TO HIS SON

From "Hamlet"

Polonius, an aged courtier, thus advises his son, Laertes, how to behave himself when he goes on a visit to France. See the story of the play on page 449.

GIVE thy thoughts no tongue,
Nor any unproportioned thought his act.
Be thou familiar, but by no means vulgar.
Those friends thou hast, and their adoption tried,
Grapple them to thy soul with hoops of steel;
But do not dull thy palm with entertainment
Of each new-hatched, unfledged comrade. Beware
Of entrance to a quarrel; but, being in,
Bear it, that the opposer may beware of thee.
Give every man thine ear, but few thy voice;
Take each man's censure, but reserve thy judgment.
Costly thy habit as thy purse can buy,
But not express'd in fancy; rich, not gaudy:
For the apparel oft proclaims the man;
And they in France, of the best rank and station,
Are most select and generous, chief in that,
Neither a borrower, nor a lender be:
For loan oft loses both itself and friend;
And borrowing dulls the edge of husbandry.
This above all—To thine own self be true;
And it must follow, as the night the day,
Thou canst not then be false to any man.

MAN'S GREATEST TREASURE

From "King Richard II."

THE purest treasure mortal times afford
Is spotless reputation; that away,
Men are but gilded loam, or painted clay.
A jewel in a ten-times-barr'd-up chest
Is a bold spirit in a loyal breast.
Mine honour is my life; both grow in one;
Take honour from me, and my life is done:
Then, dear my liege, mine honour let me try;
In that I live, and for that will I die.

THE WAYWARD DAUGHTER'S FATE

From "Two Gentlemen of Verona"

NO, trust me; she is peevish, sullen, froward,
Proud, disobedient, stubborn, lacking duty;
Neither regarding that she is my child,
Nor fearing me as if I were her father:
And, may I say to thee, this pride of hers,
Upon advice, hath drawn my love from her;
And where I thought the remnant of mine age
Should have been cherish'd by her child-like duty,
I now am full resolved to take a wife,
And turn her out to who will take her in;
Then let her beauty be her wedding dower;
For me and my possessions she esteems not.

A MAN'S GOOD NAME

From "Othello"

GOOD name in man and woman, dear my lord,
Is the immediate jewel of their souls;
Who steals my purse steals trash; 'tis something—nothing;
'Twas mine, 'tis his, and has been slave to thousands;
But he that filches from me my good name,
Robs me of that which not enriches him,
And makes me poor indeed.

THE QUALITY OF MERCY

From "The Merchant of Venice"

Portia, who speaks these words, is pleading for mercy to one she loves, a fine man, Antonio, who is under the power of a bad Jew named Shylock. See story of the play on page 330.

THE quality of mercy is not strained;
It droppeth, as the gentle rain from heaven
Upon the place beneath; it is twice bless'd—
It blesseth him that gives, and him that takes.
'Tis mightiest in the mightiest: it becomes
The thronèd monarch better than his crown;
His sceptre shows the force of temporal power,
The attribute to awe and majesty,
Wherein doth sit the dread and fear of kings;
But mercy is above this sceptred sway,
It is enthronèd in the hearts of kings,
It is an attribute to God Himself;
And earthly power doth then show likest God's,
When mercy seasons justice. Therefore, Jew,
Though justice be thy plea, consider this—
That in the course of justice, none of us
Should see salvation: we do pray for mercy;
And that same prayer doth teach us all to render
The deeds of mercy.

FRIENDS AND FLATTERERS

From verses written to Music

EVERY one that flatters thee,
Is no friend in misery.
Words are easy, like the wind;
Faithful friends are hard to find.
Every man will be thy friend,
Whilst thou hast wherewith to spend;
But if store of crowns be scant,
No man shall supply thy want.
If that one be prodigal,
Bountiful they will him call:
And with such-like flattering,
"Pity but he were a king."
But if fortune once do frown,
Then farewell his great renown:
They that fawn'd on him before
Use his company no more.
He that is thy friend indeed,
He will help thee in thy need,
If thou sorrow, he will weep;
If thou wake, he cannot sleep:
Thus of every grief in heart
He with thee doth bear a part.
These are certain signs to know
Faithful friend from flattering foe.

THE LIGHT OF OUR VIRTUES

From "Measure for Measure"

THYSELF and thy belongings
Are not thine own so proper as to waste
Thyself upon thy virtues, they on thee.
Heaven doth with us as we with torches do;
Not light them for themselves; for if our virtues
Did not go forth of us, 'twere all alike
As if we had them not. Spirits are not finely touched
But to fine issues, nor Nature never lends
The smallest scruple of her excellence;
But, like a thrifty goddess, she determines
Herself the glory of a creditor,
Both thanks and use.

THE SEVEN AGES OF MAN

WE have to remember always what kind of person Shakespeare makes the speaker of any of his famous thoughts, as the words always suit the one that speaks them. Jacques, who is made to utter these words in "As You Like It" (see page 637), was somewhat gloomy in his mood. A "pard" is a leopard, a "capon" is a tender chicken, and "sans" is the French word for "without," but is sometimes used as an English word.

ALL the world's a stage,
And all the men and women merely players:
They have their exits, and their entrances;
And one man in his time plays many parts,
His acts being seven ages. At first, the infant,
Mewling and puking in the nurse's arms;
And then the whining schoolboy, with his satchel,
And shining morning face, creeping like snail
Unwillingly to school; And then, the lover,
Sighing like furnace, with a woeful ballad
Made to his mistress' eyebrow: Then a soldier,
Full of strange oaths and bearded like the pard,
Jealous in honour, sudden and quick in quarrel,
Seeking the bubble reputation
Even in the cannon's mouth; And then, the justice,
In fair round belly, with good capon lined,
With eyes severe, and beard of formal cut,
Full of wise saws and modern instances,
And so he plays his part: The sixth age shifts
Into the lean and slipper'd pantaloon;
With spectacles on nose, and pouch on side;
His youthful hose well saved a world too wide
For his shrunk shank; and his big manly voice,
Turning again toward childish treble, pipes
And whistles in his sound: Last scene of all,
That ends his strange, eventful history,
Is second childishness, and mere oblivion;
Sans teeth, sans eyes, sans taste, sans everything.

WISE SAYINGS FROM SHAKESPEARE

HOW far that little candle throws its beams!
So shines a good deed in a naughty world.
"Merchant of Venice"

And oftentimes, excusing of a fault
Doth make the fault be worse by the excuse.
"King John"

O! it is excellent
To have a giant's strength; but it is tyrannous
To use it like a giant.
"Measure for Measure"

But 'tis a common proof
That lowliness is young ambition's ladder,
Whereto the climber—upward turns his face:
But when he once attains the upmost round,
He then unto the ladder turns his back,
Looks in the clouds, scorning the base degrees
By which he did ascend.
"Julius Cæsar"

Cowards die many times before their deaths;
The valiant never taste of death but once.
Of all the wonders that I yet have heard,
It seems to me most strange, that men should fear;
Seeing that death, a necessary end,
Will come when it will come.
"Julius Cæsar"

There is a tide in the affairs of men,
Which, taken at the flood, leads on to fortune;
Omitted, all the voyage of their life
Is bound in shallows, and in miseries.
On such a full sea are we now afloat;
And we must take the current when it serves,
Or lose our ventures.
"Julius Cæsar"

How oft the sight of means to do ill deeds,
Makes ill deeds done!
"King John"

I dare do all that may become a man;
Who dares do more, is none.
"Macbeth"

To be a queen in bondage is more vile
Than is a slave in base servility;
For princes should be free.
"King Henry VI."

Life every man holds dear; but the brave man
Holds honour far more precious dear than life.
"Troilus and Cressida"

To gild refined gold, to paint the lily,
To throw a perfume on the violet,
To smooth the ice, or add another hue
Unto the rainbow, or with taper-light
To seek the beauteous eye of heaven to garnish,
Is wasteful, and ridiculous excess.
"King John"

If all the year were playing holidays,
To sport would be as tedious as to work;
But when they seldom come they wish'd for come,
And nothing pleaseth but rare accidents.
"King Henry IV."

What stronger breastplate than a heart untainted!
Thrice is he armed that hath his quarrel just;
And he but naked, though lock'd up in steel,
Whose conscience with injustice is corrupted.
"King Henry VI."

At Christmas I no more desire a rose,
Than wish a snow in May's new-fangled mirth;
But like of each thing that in season grows.
"Love's Labour's Lost"

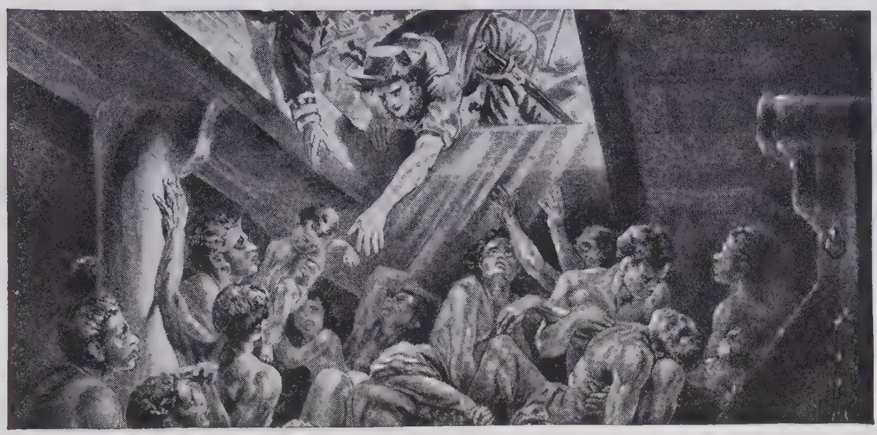
Our doubts are traitors,
And make us lose the good we oft might win,
By fearing to attempt.
"Measure for Measure"

A friend should bear his friend's infirmities.
"Julius Cæsar"

ÆSOP THE SLAVE TELLING HIS FABLES

All the world has been delighted by the fables which Æsop told to the Greeks 2,500 years ago. We cannot learn much about Æsop, but we know that he was a slave, and, it is said, that he was so deformed that for a long time no one would buy him. But at last he was bought, and his master found him so wise that he set him free. Here we see the famous story-teller delighting an audience of Greek ladies with some of his fables.

The photograph of Bishop Crowther on page 2937 is by Lyddell Sawyer.



SLAVES WHO BECAME FAMOUS

CONTINUED FROM 2797

BISHOP CROWTHER

IN the ancient days there was no country in the world in which there were not a great number of slaves; in most countries there were more slaves than there were free people. Men owned other men, just as they owned cattle, and these slaves always had to obey their masters.

Nowadays employees are not slaves, but are as free as other people, and simply work for employers in return for wages, and food, and other things. If they disobey orders, all that can happen to them is that they are dismissed and go away to another employer. They cannot be punished, because they are free people, whom the laws protect. But in the days when workers were slaves, the laws of the land did not protect them against their owners. If anyone hurt or killed another man's slave, he had to pay the slave's value to the other man; but if the owner beat his own slave, or even in some countries if he killed him, he had merely damaged some of his own property, and that was the end of the matter. We have learned to know that it is very wrong to think of any of our fellow men and women as being the property of others; yet not long ago Christian folk with white skins thought it was quite right to own human beings with black skins.

But in the ancient days, before Christianity had come into the world at all, anyone who said that it was wrong to have slaves would only have been laughed at. At first when one nation or tribe went to war with another, the captives, who were carried off to be slaves, were often the most valuable part of the spoils, and conquerors nearly always made slaves of the conquered people. They might settle down in the country, and let the conquered people live on as their slaves, or they might carry them off captive, or perhaps sell them in other countries.

Sometimes, too, roving bands of robbers would seize people and carry them off to be sold in this way, to be the slaves of masters in a foreign land. It must have been a terrible and cruel thing for anyone to be snatched away from his home and his friends, and forced to obey the commands of a master who might treat him as he chose. Still, masters were often kind to their slaves, especially to those who served them in their own houses. For most people would rather be kind than cruel; and, beside that, servants who were treated kindly would be both able and willing to do their work better than those who hated their owners. So it came to pass that there were sometimes slaves who found favor with their masters, and rose from slavery to freedom and prosperity. And here we are to read about some men who, although they had been made slaves, or perhaps were even born in slavery, have made a great mark in the world.

THE LAD WHO WAS SOLD FOR A SLAVE AND BECAME A PRIME MINISTER

First of all, there is one about whom we know already; a little lad whose father was so fond of him that all his elder brothers were jealous, and what made it worse was that he told them his dreams, in which he saw them all bowing down to him. So first they resolved to kill him, and then they thought of a better plan, since they did not quite like the idea of killing their own brother. They sold him to a band of Ishmaelites, who carried him off to the land of Egypt, and they, in turn, sold him for a slave to the captain of the king's guard, whose name was Potiphar.

Joseph was a slave when the Ishmaelites sold him, but presently Potiphar found him so clever and useful that he set him over all his house. Yet Joseph was still a slave, so that when Potiphar was angry with him he could throw his slave into prison. But we who have read the Bible know how he was taken out of prison when Pharaoh, king of Egypt, found that he could interpret dreams that had been sent as a warning, and how he became the ruler of the land of Egypt, or, as we might say, Pharaoh's prime minister. That is the oldest story we know of a slave rising to be a ruler of nations.

THE SLAVE-BABY THAT GREW UP TO BE THE WORLD'S GREATEST LAW-GIVER

And then we remember how, after a time, all the children of Israel were made slaves in Egypt—not slaves of this master or the other, but slaves of the State—and were cruelly driven to do all manner of hard work. But when one little slave-baby was born, his mother hid him in an ark, or tiny boat, where the king's daughter and her maidens found him when they went to bathe. And the slave-baby was brought up as though he had been the son of the princess herself. And in after years, he was chosen to lead the children of Israel out of Egypt to the Promised Land, and became the greatest law-giver the world has ever known. Moses was actually born a slave. There are folk who say that once upon a time there was even a slave dynasty, a family descended from slaves, who reigned in Egypt, because a nation who had been made slaves by the Egyptians, like the Israelites, got arms and rose up against the Egyptians, and set up one of themselves to be king. After they had been kings for a long time they were overthrown again. But we know nothing definite about any such thing.

Next, we have two men who became famous in quite another way. About one of them there are many stories. This was a Greek, and we all know his name, for we read in this book many of the fables that were told by Æsop the slave. The story runs that, when two Greek cities were at war with each other, the little boy who was called Æsop was carried off prisoner and made a slave. But he was so clever and witty that his master had him well taught, and after many years set him free.

HOW ÆSOP THE SLAVE REPROVED THE WISE MAN OF ATHENS

Æsop had lived among slaves, and then he lived among people who were free, and was taken into counsel by wise men and rulers of states. In another part of this book, on page 1321, we read about one of the wisest of the Greeks, called Solon, who visited Crœsus, the king of Lydia. Well, they say that Æsop was at the court of Crœsus just at that time, and that he reproved the wise Solon for lack of courtesy to so great a king as Crœsus.

So we may see how important a man the slave must have become. And there are two other stories about him, which cannot both be true. One says that he was ugly and deformed, which made it all the more notable that one who was a slave and deformed, too, should have had such pleasant and kindly fancies as we see in his fables. The other story says that a statue was set up in his honor, and it seems hardly likely that the Greeks would ever have thought that they were doing honor to a man whose shape was ugly and contemptible, by setting up a statue of him; so, after all, it may be that life was not doubly hard for poor Æsop; for being a slave was quite hardship enough to have taken all the fun out of most men's lives.

Among the Greeks and Romans it was quite a common thing for slaves who served in their master's houses to earn enough money to buy their freedom. Sometimes they continued in the service of the same master as "freed-men," and had slaves of their own. The cruel Emperor Nero, the first who persecuted the Christians, had a freed-man called Epaphroditus, and Epaphroditus had a slave who is always called Epictetus.

Though Epaphroditus had once been a slave himself, he was not a kind master, and Epictetus had a great deal to bear. In his slavery he learned to feel that, though the body may be in bondage, the soul is free, and that bodily pain and suffering are of no account as compared with the freedom of the soul. For he may always be happy who acts righteously because it is his will and desire to act righteously. And when, after a time, Epictetus got his own freedom from slavery, he taught other men to understand the wise thoughts that had come to him; and became a famous philosopher and teacher. Although, like the great Greek philosopher Socrates, he wrote no books, one of his pupils, who is called Arrian, wrote down what Epictetus had taught him. The wisest of the Romans, like the great and noble Emperor Marcus Aurelius, accounted the slave Epictetus as their master in wisdom; so that, until they learned that the truths of Christianity are higher and deeper than anything that was understood even by the wisest of the pagans, there was none who helped them more to know the wisdom of righteousness than Epictetus, who had been a slave.

Joseph's wonderful story in the Bible has fascinated us all. The hatred of his brothers, how they sold him to Arab slave dealers, his adventures as a slave in Egypt, his interpretation of Pharaoh's dream, and his elevation to be prime minister of the kingdom, all form one of the most romantic stories in history. This picture is reproduced by permission of Sir Lawrence Alma-Tadema, the artist.

But even when all the Roman world had come to profess Christianity, slavery did not cease; and the great Emperor Justinian had an adviser, who may have come as a slave from Armenia. His name was Narses. Now, Narses was a sort of cripple, so that both men and women made mock of him, as though he were hardly a man at all, and he was brought up to serve among the women. Yet Justinian found out that he was a very shrewd and able man after all, and step by step he reached high office.

What was stranger still, Justinian found that Narses could give the very wisest of counsel in war, so that when the barbarian tribes called Goths had made themselves almost masters of Italy—for the Roman emperor in those days ruled not at Rome, but at Byzantium, which we now call Constantinople—and one of the greatest of all soldiers, Belisarius, had much ado to vanquish the Goths, Narses was sent to give counsel to Belisarius. And some time later, when Belisarius himself was recalled, Narses was sent to be the general of the Roman armies. So great was his skill that some historians account him a commander greater even than Belisarius. He smote the Goths, and won back Italy, so that it was once more for a time altogether under the sway of the Roman emperor.

THE SLAVES WHO MARCHED TO THE MOUNTAINS AND BEAT THE ROMAN ARMIES

So far we have talked only of slaves who won their freedom and rose to fame; and now we have the story of a slave who made a glorious fight for freedom for himself and many other slaves. For the Romans had thousands upon thousands of slaves who worked for them, not in their houses, but on their great estates, and these were slaves indeed, for whose well-being there was none to care—they were owned body and soul by their masters. And there were others, captives who had been taken in war, who were kept that they might make sport for the Roman people by fighting as gladiators in the circus. Now, there was a certain Spartacus, a mountaineer from the land of Thrace, who had been made a prisoner, and was set among the gladiators.

But Spartacus had no mind to be a slave; and he stirred up the other gladiators, who were strong men and fierce, and skilled with their weapons, to band together and fight for their freedom rather than to make sport for the Roman crowd. And, seeing that none were more skilled in arms than Spartacus, they chose him for their leader; and they rose up with the weapons that had been given them for fighting in the arena, and marched away into the mountains, from whence they made raids into the country—for we must remember that they had all been born enemies of the hated Romans. When the Romans sent armies against them, those armies were overthrown; and in all those parts the slaves fled from their masters and joined Spartacus and his gladiators, so that Spartacus soon had a fine army behind him.

HOW THE GREAT SLAVE LEADER SPARTACUS WAS SLAIN IN BATTLE

Now, it was the desire of Spartacus that they should march out of Italy and go back to their own people in Germany or Thrace, or elsewhere; and when they marched through Italy they overthrew, one after another, the armies that the Romans sent against them. But then the followers of Spartacus deemed that they might altogether overthrow the might of Rome, and though Spartacus himself knew that to be but a vain imagination, he would not desert them, but abode with them, being resolved at least to make a valiant fight of it. And so at last the Romans sent against him an army so great that the slaves were overwhelmed altogether by numbers, despite their valor and the skill of their leader; and Spartacus was slain fighting, sword in hand. But as for the slaves who were not slain in the battle, they were cruelly put to death by the Romans to the number of 6,000, as slaves who had insolently rebelled against their masters, for whom there should be no mercy at all.

THE GREAT ARMY OF SLAVES THAT RULED EGYPT FOR 400 YEARS

We have seen how it is said that there was in Egypt an ancient dynasty of people who had been slaves and made themselves kings. Something of that kind happened in Egypt after the days of the great Sultan Saladin. For the sultans who ruled in Egypt had gathered together many slaves, white Circassians and brown Turks, making with the men regiments of soldiers, called Mamelukes, which means slaves; and the Mamelukes, under their captain, Aibek, made themselves lords of Egypt, and one or another of the Mamelukes was sultan of Egypt for some hundreds of years thereafter. And in India there was once a great emperor, named Shahab-ud-Din, who had a Turcoman slave called Kubn-ed-Din. And when Shahab-ud-Din found that Kubn-ed-Din was a wise man and brave, he made him ruler over a great

A SLAVE DRIVES BACK ROME'S ENEMIES

When the Roman emperors ruled the world from Constantinople, the western part of their empire was overrun again and again by the Goths, who carried ruin wherever they went. At last, the Emperor Justinian appointed as commander of the Roman armies in Italy a feeble and crippled old man named Narses. All the world laughed when they heard that the once mighty Roman legions were to be led by a decrepit old man of 75, who had formerly been a despised slave. But they did not laugh long. Narses, although old and feeble, was a man of vigorous mind, and a brilliant general, and he defeated the Goths, and drove them right out of Italy. In this picture we see the Goths retreating after their defeat by Narses at Mount Vesuvius in 553. They are carrying with them the body of their king, slain in battle.

province; and after Shahab-ud-Din was dead, Kubn-ed-Din ruled the province as a kingdom of his own, and was the first ruler of the slave dynasty of Delhi.

HOW A NEGRO BOY WAS MADE A SLAVE, AND AFTERWARDS BECAME A BISHOP

Slavery existed not only in the ancient world, but in the modern world. It is little more than a hundred years since the nations of Europe resolved to stop the work of the slave traders, who captured negroes—men and women and children—in Africa, and carried them off to be slaves in Mohammedan countries, or in America. About a hundred years ago a party of slave traders seized all the people in an African village, among whom there was a little boy named Adjai. They were all brought down to the coast to be shipped off to become slaves; but a British warship caught the slave-ship, and set the slaves free, as shown in the picture on page 2937. They had no home to go to, so they were taken to the British colony of Sierra Leone, where they were taught Christianity. Little Adjai was baptized, and after that he was called Samuel Crowther; and he soon became so earnest a Christian that he resolved to be a missionary. And he did his work as a missionary so well that before he died the little slave boy had become a bishop, the head of the Christian community throughout Nigeria.

There are still living to-day men who were born in slavery. Booker T. Washington died only in 1915. He was born a slave in the United States; for though the slave trade had been stopped, there were thousands and thousands of negro slaves in America, where many negroes were slaves, and the children of slaves were slaves also.

THE GREAT JOY OF THE AMERICAN SLAVES WHEN THEY WERE SET FREE

But because many people in the northern states said slavery must cease, there was a great civil war in the United States.

Booker T. Washington has told us, in the story of his life, how the news of the final victory of the North was received on the estate where he, a boy at the time, and his mother and brothers and sisters were slaves. The slaves were all summoned to the house of their owner. The family were assembled on the verandah, and there an army officer read out the glorious news that all the slaves were free and that their freedom should never be taken from them.

"My mother, who was standing by my side," writes Mr. Booker Washington, "leaned over and kissed her children, while tears of joy ran down her cheeks. She explained to us what it all meant, that this was the day for which she had been so long praying, but fearing that she would never live to see."

Now that they were free, the slaves felt that they must go away somewhere, if only for a little time, so that they might know that it was not all a dream, that they really were free. But many of them returned to the plantations to work for wages, for the masters whom they had served as slaves.

THE SLAVE BOY WHO BECAME A BRILLIANT SCHOLAR & HEAD OF A FAMOUS SCHOOL

Booker Washington had no father, but his stepfather was living, hundreds of miles away, and the whole family set out to join him. Their few possessions were carried in a little cart. Booker and his brothers and sisters tramped the whole weary way on foot. When they reached their new home, Booker was sent to school. All the scholars were asked their names, and gave Christian name and surname. Now, Booker had never had any name but Booker, but he felt that, like the rest of the boys, he must have *two* names, so without hesitation, he answered, "Booker Washington," and by that name he has ever since been known.

His schooldays were few. He had to go to work in a coal-mine to help to keep the family; but after working hard all day he studied at night, and made such splendid progress that at last he was able to go to a school.

It was the Hampton Institute in Virginia to which he went, and in order to earn his fees he had to act as porter at the school, and, during the holidays, go out to work as a waiter. He proved a good student, and was later appointed teacher at the Hampton Institute; and when a school for negroes was started at the town of Tuskegee, in Alabama, he was placed in charge. His skill as a teacher and his own character as a man have made it one of the most famous in the whole world.

THE NEXT MEN AND WOMEN BEGIN ON 3023.

THE OLD COUPLE AT THE MILL

CONTINUED FROM 2893

AN old man and his wife, who lived in a little cottage on a hillside, seemed unable ever to agree. They were always quarreling and jangling, and they became the talk of the villagers.

If the old man said a rook was black, his wife declared that it was white ; if the woman said a cow was brown, the man would insist that it was black ; and so it went on day after day.

At last their jangling was heard in Fairyland, and one of the little old men of the wood determined to put a stop to the quarreling. If the couple did not cease of their own accord, he said, then they should have a lesson which would make them agree.

But the cottager and his wife did not stop their silly quarrels.

At last one day, when they wanted some corn ground, they put the sack in an old-fashioned hand-cart, and started to wheel this to the mill that stood on top of the hill.

" You are not pulling at all, husband," said the woman, as she pushed the cart behind.

" What do you mean, wife ? " shouted the husband from the front. " Why, it is I who am getting the cart uphill. You are not pushing at all, and I believe that you are hanging on the cart into the bargain."

So they went on, and their jangling did not lighten the load. At last they managed to get the cart up the hill, and, wheeling it to the door of the mill, unloaded the sack and carried it in.

Then they went outside to look at the sails going round, and the man stood in front of the mill, while his wife went round to the back.

" Look at the sails ! " shouted the husband. " They are going round in the opposite direction to the sun ! "

" What do you mean ? " cried his wife. " They are going with the sun ! "

" You obstinate woman ! " said the man. " Anyone can see that the sails are going against the sun."

Of course, both were right, for while one was looking at the top of the sails, the other was looking at the bottom.

" Ah," thought the little man of the woods, " now is my time to teach them a lesson." So when the man cried out angrily for the tenth time, " Cannot you see that the wings are going against the sun ? " the little gnome prompted him to seize hold of a sail.

Of course, the woman answered back, and the sly gnome prompted her also to catch hold of one of the sails.

The man and woman were unable to stop the sails, and so were carried round ; but after they had gone up a little way they could hold on no longer, and fell with a bang to the ground.

" Oh," said the man, rubbing his poor head, " didn't that hurt ! "

" Yes," said the wife, also rubbing her bruises, " that it did."

Then they limped into the mill, got their flour, and trundled it off home in the cart, agreeing together for the first time—that the fall from the mill had hurt them. But as they had agreed once, they found it easier to agree again, and then again, until at last a more loving couple could not be found.

THE PRINCESS WHO BECAME A GOOSE GIRL

A BEAUTIFUL Princess was to be married to a Prince whom she had never seen.

All preparations were made for the wedding, and the time came when the Princess had to bid farewell to her mother. The Queen was very sad at this parting, for the Prince's kingdom was so far away that she might never see her daughter again.

As they were saying good-bye, the Queen pricked her finger so that three drops of blood fell on to her handkerchief. Giving it to her daughter, she said:

"Carry this with you wherever you go, and no harm can ever befall you."

The Princess became a goose girl, and spent her days tending the geese.

The Princess thought this strange, but she obeyed, and soon set out with her maid to the land where the Prince lived. Before they had gone far the Princess began to feel very thirsty.

"Please fetch me some water from the brook," she said to the maid.

But the maid answered rudely:

"I shall not. Get it yourself."

The Princess made no reply, but alighted from her horse, drew the water, and rode on again. And the handkerchief said:

"If your mother knew, it would break her heart."

By-and-by the Princess said again:

"I am thirsty. Please fetch me some water."

But the maid answered:

"You may fetch it yourself. I am not going to be your maid."

Again the Princess made no reply, but alighted from her horse and drew the water. And the handkerchief said:

"If your mother knew, it would break her heart."

The Princess wept, and the handkerchief fell from her hand into the brook.

Then the maid, who knew that the handkerchief could no longer protect her mistress, said:

"Give me your dress, and take mine. We will change places. Take my horse, and I shall take your horse, Falada. I shall marry the Prince, and everyone must think that I am the Princess. If you refuse, I shall kill you."

The Princess was so terrified that, to save her life, she consented, and they rode on. Presently they came to the palace, and the maid was treated as the Princess, and the Princess as the maid. As the poor Princess stood, sad and alone, in the courtyard, the King looked out of the window, and saw her.

"Do you want work?" he asked kindly.

"Yes, please," answered the Princess.

"I want a girl to help my lad, Kurdchen, to tend the geese," said the kindly King, "and if you would like to stay here you may be my little goose girl."

And so the Princess became a goose girl, and spent her days with Kurdchen, tending the geese.

Now, the wicked maid was afraid that the horse Falada might tell the King all that had happened, so she ordered his head to be cut off. But the Princess loved Falada, and she persuaded Kurdchen to hang its head over the kitchen door, and every day as she went out she would say to it:

"Do you know who I am, Falada?"

And the head would answer her:

"You are the Princess. If your mother knew, it would break her heart."

One day the Princess let down her golden hair while Kurdchen was by. The lad was so struck with its beauty that he wanted to cut off a lock for himself. But the Princess refused, and this made him so angry that he ran to the King and told him that she was a witch.

When the King heard the story of the talking head that hung over the door and the goose girl's beautiful golden hair, he wondered what it all meant. The next day he sent for her.

The Princess entered the palace and appeared before the King, who was so impressed with her beauty and grace that he asked:

"Who are you?"

"Alas! I dare not say," she replied. "I have sworn to tell no one, and if I break my word I shall be killed."

Then the King said:

"I am the King of all this land. No one shall hurt you. Tell me all, and I will protect you."

The Princess burst into tears.

"I am the real Princess who was to marry your son, the Prince," she said; "but my maid took away my dress and my horse because she wished to marry him herself, and she threatened to kill me if I told anyone. If my mother knew, it would break her heart."

Kurdchen ran to the King to tell him that the Princess was a witch.

"Do not be afraid," said the King, who had long suspected the maid and knew at once that this was really the Princess.

The King comforted her, had her dressed in royal robes, and sent for the Prince. She looked so beautiful and happy that the Prince immediately fell in love with her, and they were married that very day. A great feast was prepared, to which all the people of the Court were invited, and there was much rejoicing and merry-making, because the true Princess had married the Prince. The wicked maid was severely punished, as she well deserved, and banished from the country, and the Prince and Princess lived happily ever after.

THE CAT AND THE PARROT

MADAME THÉOPHILE was a sandy cat of whom a French writer, Théophile Gautier, tells us this charming story:

She had a white chest, a pink nose, and blue eyes; she was called Madame Théophile because she dwelt with me on the most friendly terms, sleeping at the foot of my bed, dreaming on the arm of my chair while I wrote, descending to the garden to follow me in my walks, assisting at my meals, sometimes even intercepting a morsel of food which I might be carrying on my fork to my mouth.

One day a friend of mine, who was going away for a few days, confided to my care his parrot. The bird, feeling himself transported to a strange land, climbed by means of his beak to the top of his perch, and, sitting there silent and trembling, rolled around him eyes full of alarm.

Madame Théophile had never seen a parrot, and this creature, so new to her, evidently caused her immense surprize. As motionless as an embalmed cat from Egypt, she regarded the bird with an air of profound meditation, putting together all the notions of natural history which she had been able to gather on the tiles, in the courtyard, and the garden. The shadow of her thoughts passed across her blinking eyes, and I could read there, quite as well as if she had spoken out with her voice, this summing up of her examination:

" Decidedly this strange creature cannot be a green fowl."

Arrived at this decision, the cat got down from the table where she had established her observatory, and went and crouched in a corner of the room, stomach on the ground, the elbows protruded, the head low, the spring of the spine extended—like a cunning panther watching gazelles who have come from their homes to quench their thirst at a lake.

The parrot followed these movements with a feverish anxiety; he bristled his feathers, rattled his chain, lifted an agitated foot, and sharpened his beak on the edge of his feeding-tin. Instinct told him that an enemy was contemplating some kind of wickedness.

As for the eyes of the cat, fixed upon the bird with a fascinated intensity, they said, in a language which the parrot perfectly well understood, and which had nothing in the least uncertain about it: " Although green, this chicken ought to be good eating."

I followed this scene with interest, ready to interfere when occasion called. Madame Théophile had drawn nearer to the parrot; her pink nose quivered, she half closed her eyes, opened and shut her claws. Little thrills ran up and down her spine; like a greedy man sitting down before a delicious truffled pullet, she delighted herself with the thought of the succulent and rare meal which she was about to make. This foreign dish, so new to her and yet so tempting, tickled her appetite.

Suddenly her back bent like a stretched bow, and one elastic jump took her to the foot of the perch. The parrot, realizing his danger, with a voice low and solemn, said suddenly:

" Have you breakfasted, James? "

This phrase caused the cat an indescribable terror, and she sprang back. A flourish of trumpets, a smash of plates and dishes, a pistol fired at the ear, could not have given her a more frantic terror. All her ideas of birds were reversed. Her face expressed clearly the staggering thought that had suddenly come to her:

" This is not a bird; this is a gentleman. He speaks! "

Then the parrot began to sing, with a great shout in his voice which was perfectly deafening, for he had realized that the fright caused by his speech was his best means of defence.

The cat threw towards me a hurried glance of interrogation, and, my reply not satisfying her, she buried herself under the bed, from which it was impossible to make her move an inch all the day long.

Next day, a little more courageous, Madame Théophile ventured to make another timid attack, but with the same fortune as had met her the last time.

From that moment she threw up the sponge, and accepted the green bird as a man who must be treated with respect.

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